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WAR MACHINE

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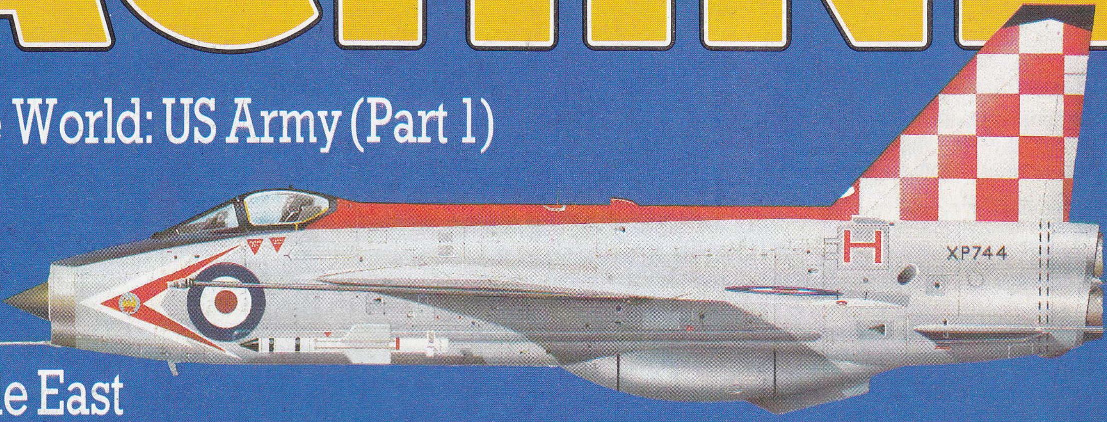

A fully illustrated guide to The First Supersonic Fighters

WAR MACHINE

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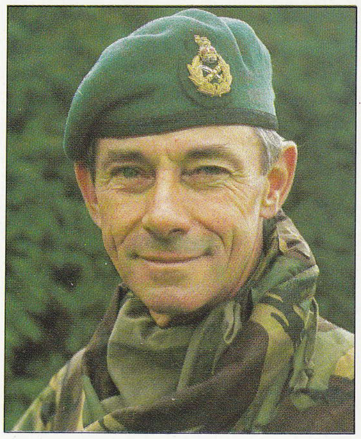

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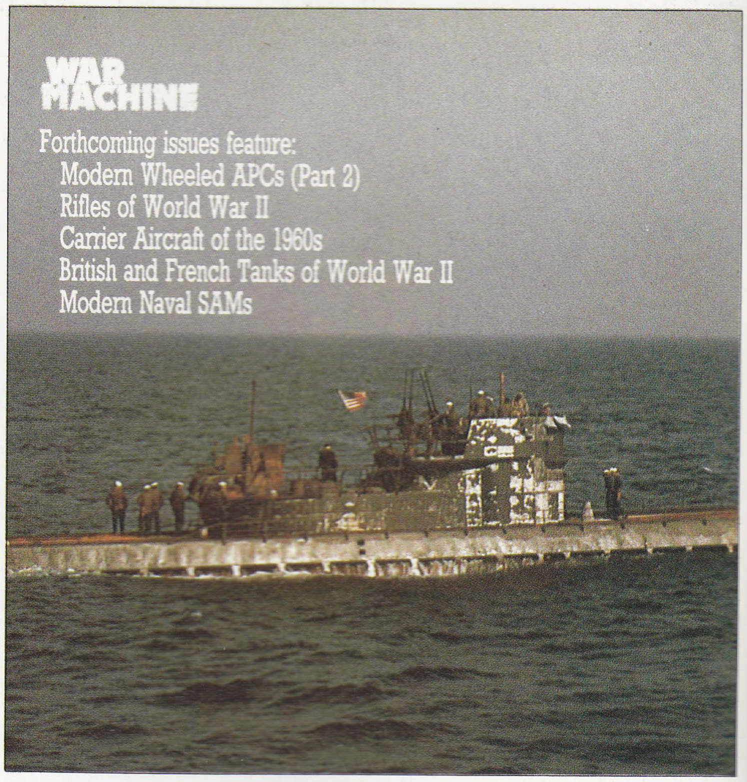

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The First Supersonic Fighters

The supersonic jet fighters of the 1960s saw combat several times throughout the decade, where the new tactics were worked out thoroughly. These actions spawned several classic aircraft such as the MiG-21, which can join the list of truly great fighters. Here we describe their development, their actions and how their design teams made supersonic flight a practical proposition.

55118
U.S. AIR FORCE
F-107A

One that didn't make it: the North American F-107. Industrial politics prevented this very fine aircraft from making it to the front line.

By the start of the 1950s, the fighter designers had their sights firmly set on supersonic flight and were working rapidly towards true supersonic fighters (as opposed to transonic aircraft often only able to reach Mach 1 in a shallow dive). When the designs reached fruition, the course of air warfare changed considerably, with aircraft able to intercept each other at greater distances and in shorter times than had been previously possible. Dogfights, however, were not fought at supersonic speeds, a trend that has lasted to this day.

A whole new realm of military aircraft opened up rapidly, with the North American F-100 and Mikoyan-Gurevich MiG-19 leading to the classic Dassault Mirage III, McDonnell F-4 Phantom II and MiG-21. These equipped the air forces of most of the major nations, alongside the Lockheed F-104 Starfighter, and these types were soon finding themselves ever more involved in action, mostly against each other. The two wars in the Middle East and the long, protracted air war over the spectacular jungles, deltas and mountains of Vietnam forged the tactics of air combat between supersonic-capable aircraft, and these tactics have lasted into the 1980s. Of course, many of the aircraft described here still fly regularly as the front-line equipment of many nations, yet their importance has been largely taken over by types such as the General Dynamics F-16 and Mikoyan-Gurevich MiG-23. Aircraft from the previous subsonic era are still flying, and of course were used widely throughout the period covered by this issue.

A fashion set during the later years of World War II was that of fighters being able to carry out ground attack missions as well as their traditional air-to-air role. This had been developed with the first generations of jet fighters and, when the supersonic age arrived, these aircraft were often used more as bombers than as fighters. The Vietnam war graphically illustrates the new breed of air war, with only a handful of Phantoms carrying air-to-air missiles whilst the rest of the Phantoms, F-105 Thunderchiefs and F-100 Super Sabres carried almost entirely bombs and other air-to-ground loads. Even the Lockheed F-104 Starfighter was employed for a while in Vietnam as a 'mud-mover'. There must have been many fighters which never even saw a Sidewinder in Vietnam, let alone carried one.

The air combats that took place over Vietnam and especially the Sinai Desert during the 1967 and 1973 wars were different from those of Korea, as the air-to-air missile, especially short-range missiles such as Sidewinder and its Soviet copy 'Atoll', replaced cannon as the main armament for fighting. Cannon were still used for extreme close-in work, and several of the experienced Israeli pilots used only cannon as a show of bravado.

Together with the McDonnell F-4 Phantom II, these aircraft have shaped the modern fighter scene more than any other group, and their influence will last for many years more. The lessons learned in all their actions, not only Vietnam and the Middle East, but those over the Indo-Pakistan border and over Cyprus, have provided the current military strategists with all the experience of air combat needed to plan future defence.

Supersonic fighters were eagerly awaited by politicians, air forces, schoolboys and Hollywood alike. A series of exciting designs were unveiled, especially from America, where the 'Century Series' caught the imagination of the world. First came the North American F-100 Super Sabre, shown here, but other classics were soon to follow.

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U.S. AIR FORCE

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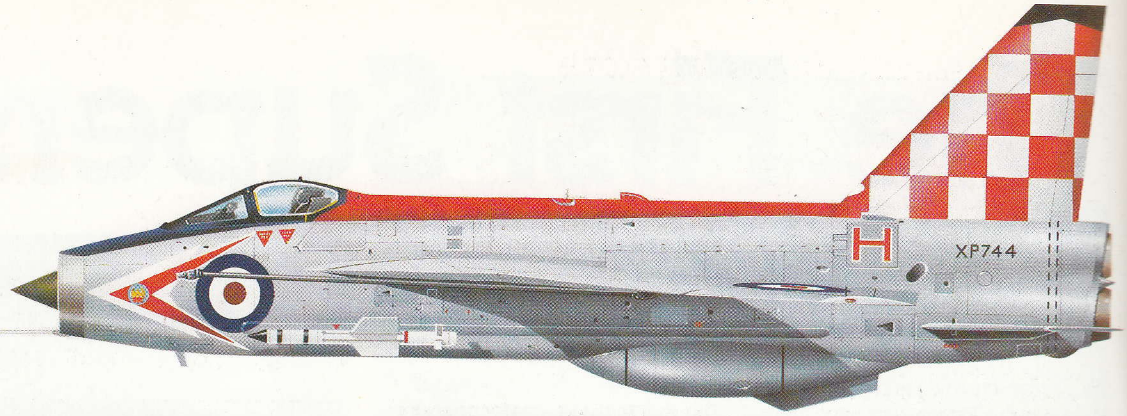
BAC Lightning



Above: Lightnings flew for many years with the RAF in natural metal finish and vivid paint schemes. This F.Mk 3 served with No. 56 Sqn at Wattisham in 1965, when the type was the UK's main air defence fighter.

Attaining operational service during the course of 1960, the **BAC Lightning** holds the distinction of being the first British aircraft to exceed Mach 2 in level flight, and has been an integral part of the UK's aerial defences for the past 24 years.

Development of what eventually became the Lightning can be traced back to 1947 when the English Electric Company was awarded a study contract for a supersonic research aircraft. Known as the **P.1**, this made its maiden flight in early August 1954 and subsequently demonstrated Mach 1+ performance, serving as a starting point for the **P.1B** which far more closely approached the requirements needed by an operational aircraft. Flight trials with the P.1B began in April 1957 and showed sufficient promise to warrant a contract for 20 pre-production test specimens of the Lightning, as the type had by then been named.

The first squadron to equip was No. 74 at Coltishall, this receiving the **Lightning F.Mk 1** variant which also served with Nos 56 and 111 Squadrons. Production then switched to the **Lightning F.Mk 2**, which offered better performance and was armed with Red Top missiles in place of the Lightning F.Mk 1's Firestreaks. Two squadrons received this model, both being quickly moved to West Germany, whilst the much improved **Lightning F.Mk 3** eventually equipped five home-based squadrons from mid-1964 onwards. The final single-seat Lightning to see service with the RAF was the **Lightning F.Mk 6** with a greatly modified wing and much improved fuel capacity, and this model remains active today with two squadrons at RAF Binbrook.

In addition to single-seaters, two two-seat variants were also built for training duty, these being the **Lightning T.Mk 4** and **Lightning T.Mk 5**, and a few of the latter mark are also still airworthy.

Modest success was also achieved on the export front, Saudi Arabia and Kuwait purchasing close to 50 aircraft between them. These are now believed to have been retired, being replaced by the McDonnell Douglas F-15 and Dassault-Breguet Mirage F.1 respectively.

Specification

BAC Lightning F.Mk 6

Type: single-seat all-weather interceptor

Powerplant: two Rolls-Royce Avon Mk 302 turbojets, each rated at 7112-kg (15,680-lb) afterburning thrust

Performance: maximum speed 2414 km/h (1,500 mph) at 12190 m (40,000 ft); initial climb rate 15240 m (50,000 ft) per minute; service ceiling 16765 m (55,000 ft); range 1287 km (800 miles) on internal fuel

Weights: empty about 12701 kg (28,000 lb); normal loaded 19047 kg (42,000 lb); maximum take-off about 22680 kg (50,000 lb)

Dimensions: span 10.62 m (34 ft 10 in); length 16.84 m (55 ft 3 in) including probe; height 5.97 m (19 ft 7 in); wing area 35.31 m^2 (380.1 sq ft)

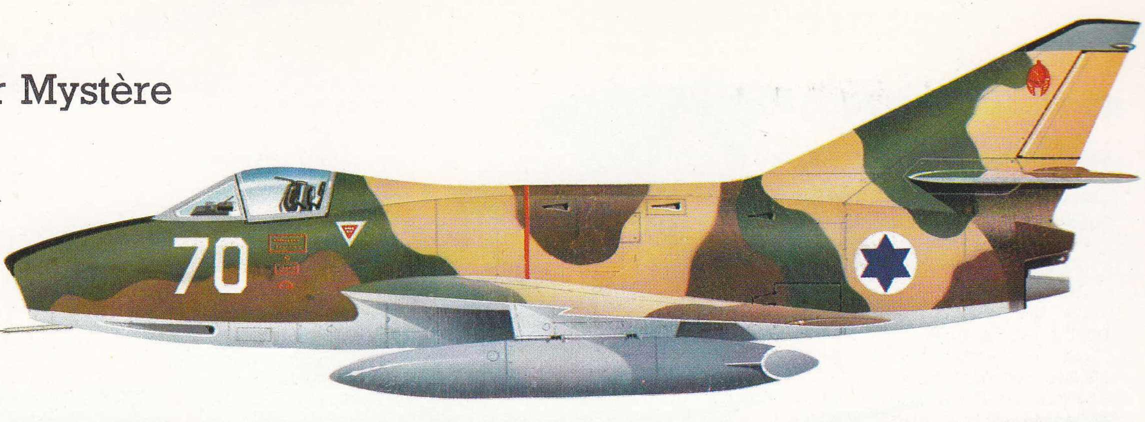
Armament: two 30-mm Aden cannon, plus two Firestreak or Red Top infra-red homing air-to-air missiles

The export derivative of the Lightning F.Mk 6 was the F.Mk 53, supplied to Kuwait and Saudi Arabia; one of the latter's aircraft is seen here. Two-seat trainers were also supplied with the designation T.Mk 55.

A Lightning F.Mk 3 of No. 74 Sqn displays the carriage of the Firestreak missiles and the original straight wing.

FRANCE

Dassault Super Mystère



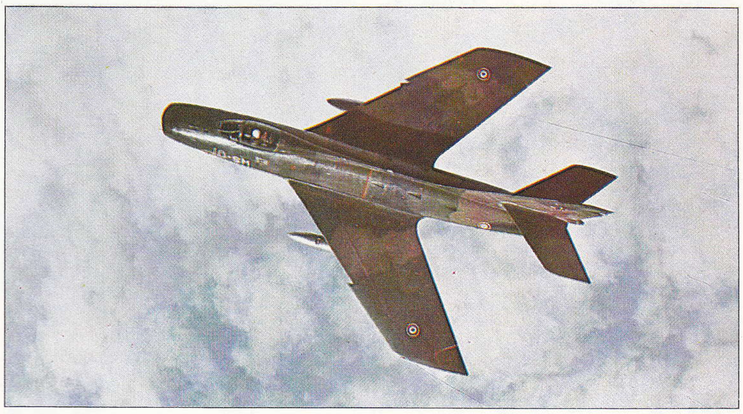
Above: Israel was a major operator of the Super Mystère and her aircraft saw much action, especially in the Six Day War of 1967, where it was employed in the ground-attack role using iron bombs.

Unique in being the first Western European aircraft capable of supersonic speed in level flight, the **Dassault Super Mystère** has virtually disappeared from the scene although a few are understood still to be active with the Honduran air force.

A logical development of the earlier Mystère, the Super Mystère first flew in prototype form on 2 March 1955, although this aircraft was powered by a Rolls-Royce Avon rather than the SNECMA Atar 101G which was fitted to production-configured machines. Five pre-production test specimens followed the prototype down the assembly line, the first of these getting airborne on 15 May 1956, whilst production **Super Mystère B-2** aircraft began to enter service with the 10^e Escadre de Chasse during 1957, other operational units being the 5^e Escadre at Orange and the 12^2 Escadre at Cambrai. Production terminated during 1959, by which time some 180 Super Mystères had been built, this total including 24 for service with the Israeli air force, with which they saw combat action on several occasions.

Development of the type did not cease with the Super Mystère B-2 model, for Dassault also completed two prototypes of the **Super Mystère B-4**. Powered by a single SNECMA Atar 09C engine, this flew for the first time on 9 February 1958 and eventually achieved a top speed of Mach 1.4 in level flight at 11000 m (36,090 ft). In the event, however, the even more promising Dassault Mirage III was coming along and the Super Mystère B-4 eventually slipped quietly into obscurity.

The only Super Mystères now flying are those of the Honduran air force, this air arm having received 12 from Israel during the 1970s. These aircraft provide further evidence of Israeli ingenuity, for they were all modified to take a non-afterburning Pratt & Whitney J52 turbojet.



The Super Mystère was employed by France from 1957 until the late 1970s. This Armée de l'Air example shows the dogtooth in the leading edge, which improved high-altitude manoeuvrability. Armament consisted of two 30-mm cannon and internal rockets, with pylons for external stores. Most aircraft carried long-range fuel tanks under the wings.

Specification
Dassault Super Mystère B-2
Type: single-seat fighter-bomber
Powerplant: one SNECMA Atar 101G-2 or Atar 101G-3 turbojet rated at 3400-kg (7,495-lb) dry thrust and 4460-kg (9,833-lb) afterburning thrust
Performance: maximum speed 1195 km/h (743 mph) at altitude; initial climb rate 5335 m (17,500 ft) per minute; service ceiling 17000 m (55,775 ft); range (clean) 870 km (540 miles)
Weights: empty 6930 kg (15,278 lb); normal loaded 9000 kg (19,842 lb); maximum take-off 10000 kg (22,046 lb)
Dimensions: span 10.52 m (34 ft 6 in); length 14.13 m (46 ft 4¼ in); height 4.55 m (14 ft 11 in); wing area 35.00 m^2 (376.75 sq ft)
Armament: two 30-mm DEFA cannon and 35 68-mm (2.68-in) unguided rockets (the latter in a belly pack), plus up to 1000 kg (2,205 lb) of external ordnance including bombs and rockets

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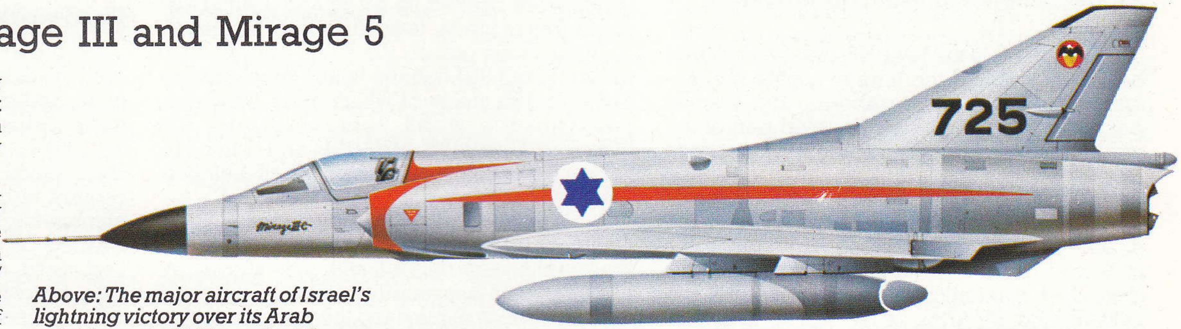
FRANCE

Dassault Mirage III and Mirage 5



Above: The major aircraft of Israel's lightning victory over its Arab neighbours in 1967 was the Mirage III. This was used for both air-to-air and air-to-ground missions.

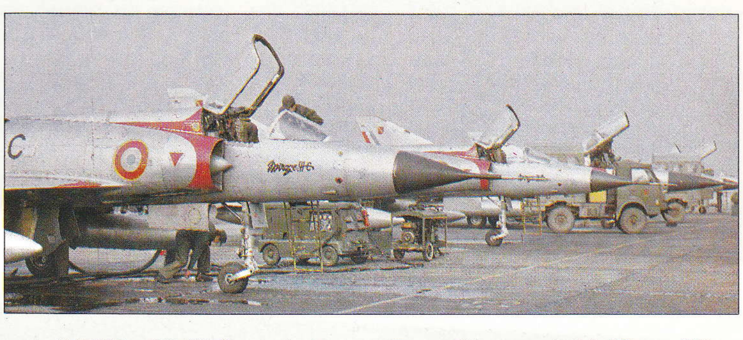
By far the most successful post-war European fighter aircraft, the **Dassault Mirage III** and **Mirage 5** remained in production in late 1984, albeit in a very small way.

Developed in response to a French air force requirement of the early 1950s, the Mirage was one of three submissions put forward, all of which were intended to use dual turbojet/rocket power in order to gain altitude rapidly in fulfilling the primary task of interception. Subsequently, it became clear that this unusual concept significantly impaired endurance and Dassault returned to the drawing board, coming up with the now familiar tailless delta which relied on a single SNECMA Atar 101G turbojet for propulsion, plus an optional boost rocket.

Construction of a private-venture prototype forged ahead rapidly, this eventually taking to the air for the first time during November 1956 and very quickly vindicating Dassault's theories, whilst at the same time providing valuable data which could be incorporated in any future production variant.

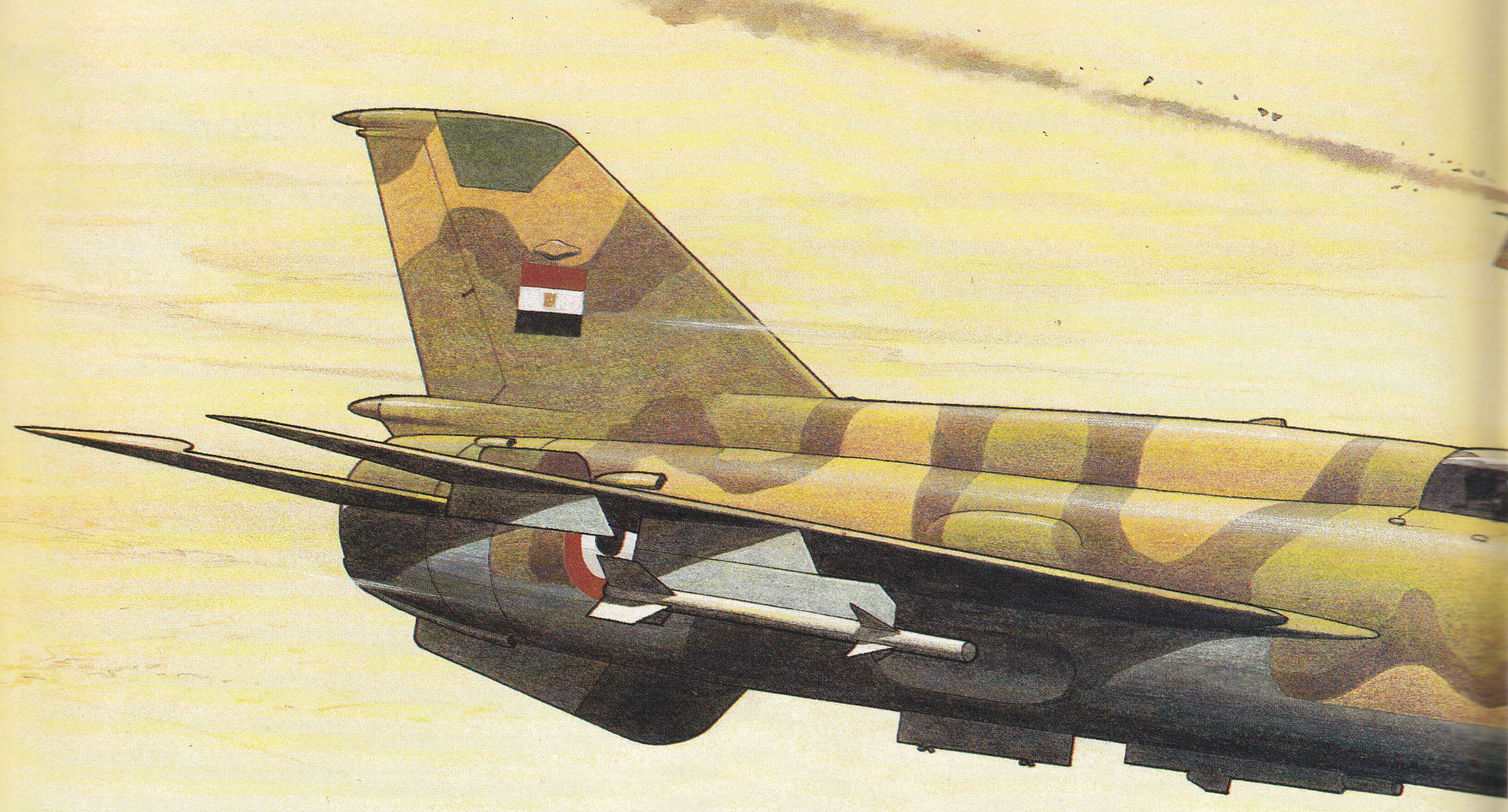
Official interest, initially lukewarm, was quickly confirmed by an order for 10 pre-production specimens just six months after the maiden flight. Testing and evaluation of these began in May 1958 and quickly led to the first major production order for a variant known as the **Mirage IIIC**, this duly entering service at Dijon during 1961.

From then on, the Mirage never looked back, successive developments including the **Mirage IIIB** two-seat pilot training version, the **Mirage IIIE** for tactical nuclear strike and conventional attack, and the **Mirage IIIR** for reconnaissance. In addition to the large numbers built for service with the French air force, versions of all four basic types have been exported throughout the world.



Dassault's remarkable Mirage III has served with the Armée de l'Air since 1961, and still flies in large numbers. These early Mirage IIICs are receiving pre-flight preparations.

Specification
Dassault Mirage IIIE
Type: single-seat all-weather fighter-bomber
Powerplant: one SNECMA Atar 9C turbojet rated at 6205-kg (13,680-lb) afterburning thrust, plus one optional SEPR 844 rocket rated at 1500-kg (3,307-lb) thrust
Performance: maximum speed 2350 km/h (1,460 mph) at 12200 m (40,025 ft); climb to 11000 m (36,090 ft) in 3 minutes; service ceiling (without rocket) 17000 m (55,775 ft); combat radius 1200 km (746 miles) on a ground-attack mission
Weights: empty 7200 kg (15,875 lb); normal loaded (clean) 9800 kg (21,605 lb); maximum take-off 13500 kg (29,762 lb)
Dimensions: span 8.22 m (26 ft 11½ in); length 15.03 m (49 ft 3½ in); height 4.50 m (14 ft 9 in); wing area 35.00 m^2 (376.75 sq ft)
Armament: two 30-mm DEFA cannon, plus up to 2270 kg (5,004 lb) of external ordnance including air-to-air missiles, air-to-surface missiles, bombs, rockets and napalm



Air War in the Middle East

The aircraft developed by France and the Soviet Union clashed spectacularly over the Suez region in 1967, testing out all the developments of the previous decade. The next few years saw these aircraft, and newcomers from America, locked in battle time and time again.

Since its creation in May 1948, the state of Israel has spent much of the time in a state of near-war with its Arab neighbours, the uneasy peace that prevails in this troubled part of the world being shattered on numerous occasions by full-blooded conflict. In most of these periods of hostility the Israeli Defence Force/Air Force has been at the very heart of the action, usually demonstrating superior ability to that of its adversaries and gaining a well-deserved reputation as being amongst the best-trained air arms in the world. This elevated status is perhaps best illustrated by examining the IDF/AF's part in the so-called 'Six-Day War' of June 1967 when, in a matter of just a few hours, it all but wiped out aerial opposition by a series of well-planned and brilliantly executed pre-emptive strikes.

The build-up to open warfare in 1967 took place over a period of months, but appears to have been largely prompted by Egypt's President Nasser, who directed Egyptian troops to occupy the Sinai peninsula during May of that year. Since this inhospitable tract of land served as a 'buffer' between the two nations it was hardly surprising that Israel responded with a partial mobilization, but the situation worsened almost immediately when Nasser ousted troops of the United Nations Organization undertaking the peace-keeping function in Sinai. At the same time Syria and Jordan each mobilized, which meant that Israel was now threatened from virtually all sides. A further factor in the worsening situation was the closure of the Straits of Tiran to sea-going traffic bound for Israel. Thus, by the end of May 1967 it was evident that it was just a matter of time before the rapidly-increasing tension erupted into full-scale warfare, and the only real question being asked at the time was concerned with who would strike first.

At this time Israel stood totally alone, facing the armed forces of Egypt, Jordan and Syria which were backed up by air and ground elements from Algeria, Iraq, Kuwait and Lebanon. In terms of air power, the Arab nations could muster about 650 fighters whilst Israel possessed only 196, many of which were of inferior performance when compared with the Mikoyan-Gurevich MiG-19s and MiG-21s, Sukhoi Su-7s and Hawker Hunters of their hostile neighbours.

In a war of attrition, it was evident that Israel would almost certainly be overwhelmed, and the Israelis were thus left with little alternative but to opt for a pre-emptive strike: if they could thus succeed in eliminating the threat posed by enemy air power and so gain control of the skies, they could then turn their attention to ground forces secure in the knowledge that the opposing armies could not call for aerial protection. Such a course of action did at least hold out the prospect of averting eventual defeat, although it was quite clearly a gamble for the very highest stakes, namely the matter of survival of Israel as a sovereign nation.

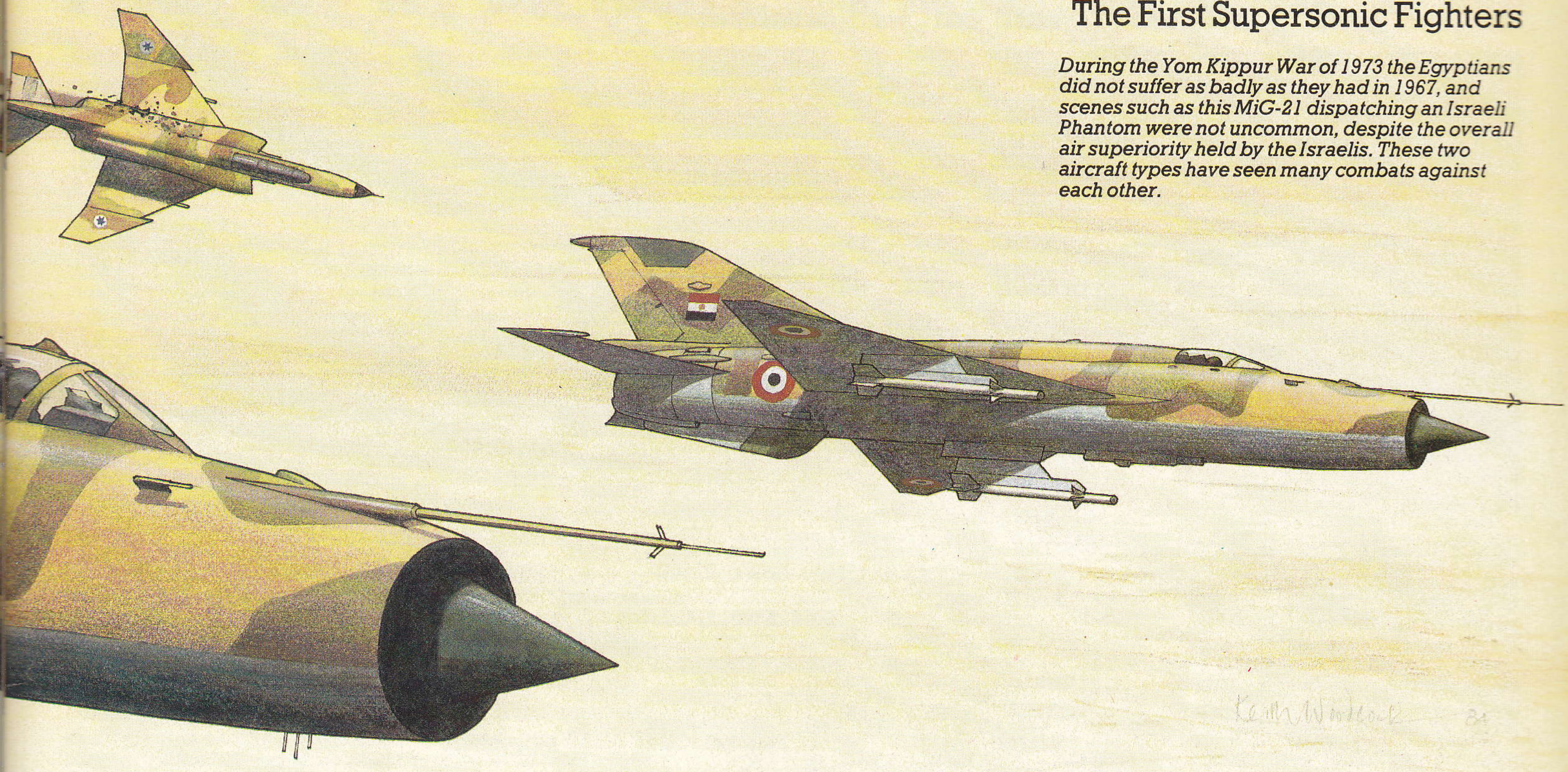
On the morning of 5 June 1967, the IDF/AF swung into action, its onslaught being directed initially against Egypt's large and well-equipped air force. Within an hour of the attacks beginning, air bases at Beni Sueif, Bir Tamada, Fayid, Gabel Libni, Inchas and Kabrit had been rendered inoperative, whilst Egypt's fleet of 30 Tupolev Tu-16 'Badger' bombers at Cairo West had been wiped out, thus removing at a stroke one of the greatest threats to Israel. In the initial phases of the aerial assault, which was accomplished mainly by Dassault Mirage IIICJs, Dassault Super Mystère B-2s, Dassault Mystère IVAs and Sud-Ouest Vautour IIAs, virtually the entire IDF/AF inventory was committed to action, just eight fighters being held back for defensive purposes. But the flawless execution of the plan meant that within three hours of hostilities beginning, the Egyptian air force had virtully ceased to exist as an effective fighting force, close to 300 aircraft at 17 airfields being destroyed on the opening day.

Hard work for the pilots

With only a limited number of combat aircraft available, intensive flying was demanded of all, and many Israeli pilots completed up to eight sorties per day, using conventional 250-kg (551-lb) and 500-kg (1,102-lb) bombs on their initial pass before returning to strafe ground targets with cannon armament. With ammunition expended, the Israeli aircraft then headed back to home base in order to refuel and rearm, the efforts of the pilots being more than matched by those of the ground crews who routinely accomplished turn-round in just seven or eight minutes, permitting the fighters to return to the fray within the hour.

With the Egyptian air force effectively out of commission for the duration, attention then switched to the airfields of Iraq, Jordan and Syria and within another hour eight of these had also been reduced to a state of inoperability, approximately 50 aircraft and helicopters also being destroyed. Thus, in just four hours, the IDF/AF had scored a crushing victory over the numerically superior forces of its adversaries and, far more importantly, had paved the way for the ground battle to be won. Once again, the Arab nations possessed far larger forces, up to 500,000 troops being supported by nearly 2,000 armoured vehicles; Israel, on the other hand, could muster just 50,000 troops plus 200,000 reservists and approximately 850 armoured vehicles, many of which were of World War II vintage.

Happily for Israel, the availability of air power did more than just balance the equation, and for much of the remainder of the 'Six-Day War' IDF/AF aircraft were concerned mainly with



During the Yom Kippur War of 1973 the Egyptians did not suffer as badly as they had in 1967, and scenes such as this MiG-21 dispatching an Israeli Phantom were not uncommon, despite the overall air superiority held by the Israelis. These two aircraft types have seen many combats against each other.

close air support of the army, flying repeated missions against enemy armour, strongpoints and troop concentrations with rockets, napalm, bombs and gun fire as they helped soldiers of the Israeli army in the advance across Sinai. In addition to the principal types already detailed, other types used in the support were the Dassault Ouragan and the Fouga Magister, the latter type being piloted mostly by reservists and proving quite effective in this, its first exposure to combat.

The success of the pre-emptive strikes of the morning of 5 June was such that encounters between oppositing fighters were relatively few, but in the small number of engagements which did occur, Israeli pilots again demonstrated superior qualities, claiming victories over Egyptian MiG-21s and Su-7s and Jordanian Hunters amongst others, most of these falling victim to the Mirage IIICJ's twin 30-mm DEFA cannon installation.

By the end of the brief but bloody conflict, Israel had decimated Arab air power, destroying more than 350 aircraft and helicopters. This remarkable achievement was not accomplished without loss, however, for some 40 IDF/AF aircraft fell foul of the enemy. Included in this tally of attrition were three Ouragans, eight Mystère IVAs, three Super Mystère B-2s, six Mirages, five Vautours and six Magisters, all of which represented a great blow; but more serious still was the loss of 20 invaluable pilots. Not surprisingly, losses were heaviest during the first couple of days of the war, when the IDF/AF was concerned principally with attacking air bases and other ground targets within the territory of its neighbours. Most of the casualties were caused by ground-based anti-aircraft artillery, the Egyptian bases being particularly well-defended in this respect.

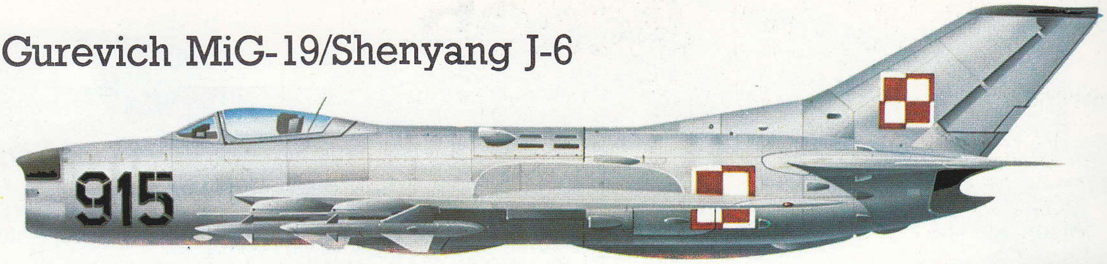
In the event the stunning success of the 'Six-Day War' did succeed in bringing back an uneasy state of peace in this part of the Middle East for several years. However, the IDF/AF's brilliant strategy was soon rendered more or less void by the Soviet Union, which very quickly set about the task of making good the losses suffered by the Arab nations. Within just a few weeks of the initial strike, Egypt's air force had been rearmed on a quite massive scale, the 90 MiG-21s that were lost being replaced on a one-for-one basis by new aircraft. Further, the number of MiG-19s on hand had virtually doubled to 120 whilst the original fleet of 30 Tu-16s (all destroyed on 5 June) had been largely made good with the arrival of 24 more aircraft of this type.

In subsequent years, modernization further improved Egypt's capability with regard to aerial warfare, and when war broke out again during October 1973, the Egyptian air force gave a far better account of itself although, once again, Israel did eventually emerge victorious.

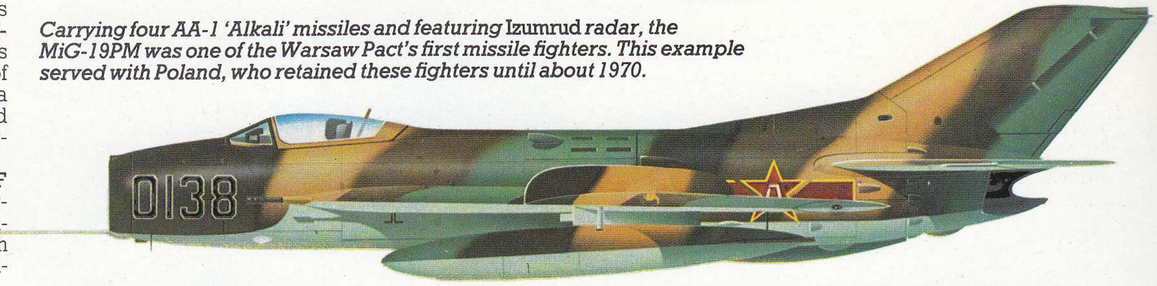
The death of an Egyptian MiG-21 at the hands of an Israeli Phantom is dramatically caught in a camera-gun film sequence over the Suez Canal battlefield.

USSR/CHINA

Mikoyan-Gurevich MiG-19/Shenyang J-6



Carrying four AA-1 'Alkali' missiles and featuring Izumrud radar, the MiG-19PM was one of the Warsaw Pact's first missile fighters. This example served with Poland, who retained these fighters until about 1970.



The State Aircraft Factory at Shenyang began producing copies of the MiG-19 for the Chinese air force under the designation J-6. These appeared mainly in natural metal but a few were camouflaged in the 1960s.

Europe's first truly supersonic production jet fighter traces its lineage back to the late 1940s and was initially conceived around the newly-developed Lyulka AL-5 axial-flow jet engine. However, slow progress with this powerplant prompted a change to a twin-engine design with a pair of Mikulin AM-5s. In its earliest form, as the **I-350**, the **Mikoyan-Gurevich MiG-19** featured a T-tail layout but this was quickly revised following the loss of the prototype as a result of flutter, a low-set tailplane being adopted and successfully flown on the **I-350(M)** during late 1952.

Production-configured **MiG-19F** fighters began to appear soon afterwards, but these were destined to enjoy only short service careers, high attrition rates bringing about the model's forced retirement.

The second version to make its debut was the slab-tailplane **MiG-19S** which began to enter service in 1955, and this proved to be much more reliable although it was quickly supplanted by the **MiG-19PF**, which introduced *Izumrud* radar and which ultimately provided the basis for the first supersonic Soviet missile-armed fighter, the **MiG-19PM**, backbone of Soviet air defences for a number of years. The MiG-19 has the NATO reporting name **'Farmer'**.

Soviet manufacture of the MiG-19 is understood to have ceased during 1958 but the type remained in production in Czechoslovakia until at least 1961, whilst a copy, known as the **J-6**, has been built by China's Shenyang factory for many years.

Examples of the J-6 have also been supplied to a number of friendly nations including Albania, Pakistan, Tanzania and Vietnam, the Pakistani machines being particularly unusual in that they are fitted with British Martin-Baker ejection seats and have provision for carriage of the American AIM-9 Sidewinder air-to-air missile.

Although now rather dated, the MiG-19/J-6 is still a most potent warplane if flown by an experienced pilot, possessing great agility and devastating guns.

Specification

Mikoyan-Gurevich MiG-19/Shenyang J-6C

Type: single-seat fighter

Powerplant: two Wopen-6 (Tumansky R-9BF-811) turbojets, each rated at 3250-kg (7,165-lb) afterburning thrust

Performance: maximum speed 1540 km/h (957 mph) at 11000 m (36,090 ft); initial climb rate more than 9145 m (30,000 ft) per minute; service ceiling 17900 m (58,725 ft); tactical radius 685 km (425 miles) with two drop tanks; ferry range 2200 km (1,365 miles) with maximum internal and external fuel

Weights: empty 5670 kg (12,700 lb); normal loaded 7545 kg (16,634 lb); maximum take-off 8965 kg (19,764 lb)

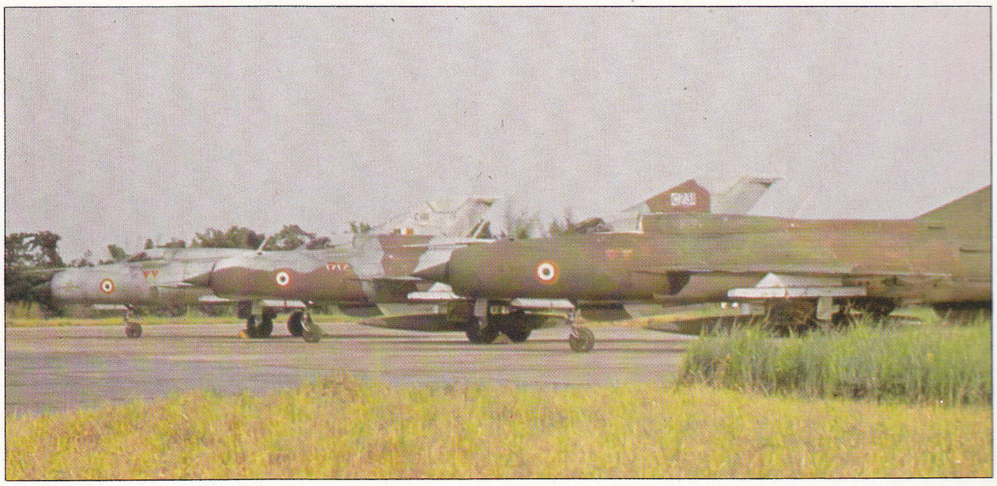
Dimensions: span 9.20 m (30 ft 2¼ in); length 12.60 m (41 ft 4 in) excluding probe; height 3.88 m (12 ft 8¾ in); wing area 25.00 m^2 (269.1 sq ft)

Armament: two or three 30-mm NR-30 cannon, plus up to 500 kg (1,102 lb) of external ordnance including four air-to-air missiles, rockets and bombs

Pakistan has been a major recipient of the Shenyang J-6 and this country has appreciated the type's toughness and agility. The Pakistani J-6s are fitted with Martin-Baker ejection seats and are Sidewinder-capable.

MiG-21 in Action

Built in greater numbers than any other post-war fighter, the MiG-21 has seen action in all quarters of the globe, where its agility and basic structure have stood up well to the more capable fighters it has met.



One of several countries to have taken its MiG-21s to war is India, whose aircraft took part in the conflict with Pakistan in 1971. The Indians licence-produced the MiG-21 for their own air force in a variety of versions.

Having now completed a quarter century of service, the MiG-21 is assured of a place in aviation history as one of the most successful fighters of the period after World War II, and in its final production form as the MIG-21bis 'Fishbed-N' it is clearly far superior to the rather unsophisticated aircraft which began to join the Soviet air force in 1959. Currently in service with a host of air arms ranging from Afghanistan to Zambia, the MiG-21 is also a combat veteran of some note, having seen plenty of action in Vietnam, the Middle East and over the Indian sub-continent.

In the course of combat action the fortunes of the MiG-21 have been mixed, with aircraft of the Egyptian and Syrian air forces taking a real battering at the hands of the Israelis, whilst those of the Indian air force are generally regarded to have performed well in the 1971 Indo-Pakistan War. A similar story also emerges from South East Asia, where MiG-21s of the North Vietnamese air force scored a number of successes, although in combat with McDonnell Douglas F-4 Phantoms they almost invariably seemed to come off worse. But this may well have been related to levels of pilot skill rather than to shortcomings on the part of the Soviet-built fighter.

In August 1964, just a few days after the so-called Tonkin Gulf incident which sparked off massive US involvement in South East Asia, a batch of 30 MiG-17 fighters arrived at the Phuc Yen air base in North Vietnam, but it was not until the summer of 1966 that the MiG-21 was first encountered in combat and thereafter the number available to the North Vietnamese rose fairly rapidly, reaching a peak of about 50 when the US air campaign against North Vietnam ceased in late 1968. By 1972, when the USA resumed raids on North Vietnam, the number of MiG-21s had risen yet again to just under 100, and these did succeed in disrupting US bombing missions to some extent although they were often withdrawn to the sanctuary of China, a 'no-go' area for US pilots.

During the 1966-8 timeframe, MiG armament generally comprised an integral cannon backed up by a pair of 'Atoll' air-to-air missiles, a weapon which possessed similar performance

One of the earliest MiG-21s, this MiG-21F was supplied to Finland in 1963. The aircraft is fairly primitive compared to later models, carrying little in the way of all-weather sensors and extremely limited in range and weapons.

USSR

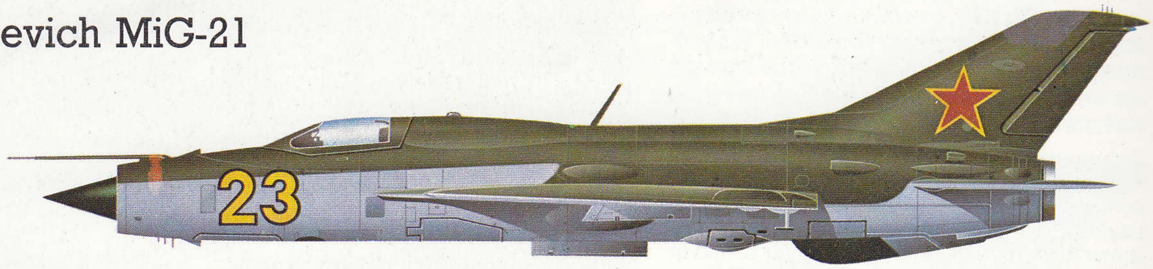
Mikoyan-Gurevich MiG-21

Continuing in production and development more than 25 years after its maiden flight, the **Mikoyan-Gurevich MiG-21** looks set fair to establish a longevity record which is unlikely to be equalled and provides perhaps the classic example of how an aircraft can 'grow' in service.

Development of the MiG-21 began during the mid-1950s and was in large part predicated upon the experience gained in the Korean War, which indicated a need for an uncompromised air superiority fighter. A series of prototypes was constructed and flown in 1955-6, and after detailed study it was decided to adopt the tailed-delta **Ye-5** as the basis for a new fighter, a few examples of the pre-series **Ye-6** entering service with a trials unit in 1957, but it was not until 1959 that the first definitive variant became available. This was the **MiG-21F**, essentially a fine-weather interceptor possessing 'short legs' and only marginal payload capability.

Subsequent redesign has seen the MiG-21 assume a multitude of functions from interception through reconnaissance to strike and close air support and in its most recent guise, as the **MiG-21bis**, it is considered to possess genuine multi-role capability although range and payload potential are still somewhat limited. Nevertheless, the MiG-21bis is now the principal export variant and could conceivably be encountered anywhere where Soviet influence is strong. The NATO reporting name for the series is **'Fishbed'**.

Currently in service with more than 30 air arms throughout the world, variants of the MiG-21 have engaged in combat on numerous occasions, from Israel to India and from Afghanistan to Vietnam, with varying degree of success, but there can be little doubt that in the hands of a skilled pilot it is still a most capable opponent.



The first version in service with the enlarged nose cone, necessitated by the larger R1L radar, was the MiG-21PF, built in vast numbers in the 1960s to equip the air defence regiments of the Soviet Union.

Specification
Mikoyan-Gurevich MiG-21bis

Type: single-seat multi-role fighter
Powerplant: one Tumansky R-25 turbojet rated at 5800-kg (12,790-lb) dry thrust and 7500-kg (16,535-lb) afterburning thrust
Performance: maximum speed 2,230 km/h (1,386 mph) at altitude; initial climb rate 17675 m (57,990 ft) per minute; service ceiling about 17500 m (57,415 ft); ferry range about 1590 km (988 miles)
Weights: empty 6200 kg (13,670 lb); normal loaded 7960 kg (17,550 lb); maximum take-off about 10000 kg (22,046 lb)
Dimensions: span 7.15 m (23 ft 5½ in); length about 17.56 m (51 ft 8½ in) including probe; height 4.50 m (14 ft 9 in); wing area 23.00 m^2 (247.6 sq ft)
Armament: one 23-mm GSh-23L twin-barrel cannon plus up to 1500 kg (3,307 lb) of external ordnance including air-to-air missiles, air-to-surface missiles, bombs and rockets

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to the Sidewinder which it closely resembled. Improving capability meant that in 1972 the MiGs usually carried four of these missiles as well as a single 23-mm cannon.

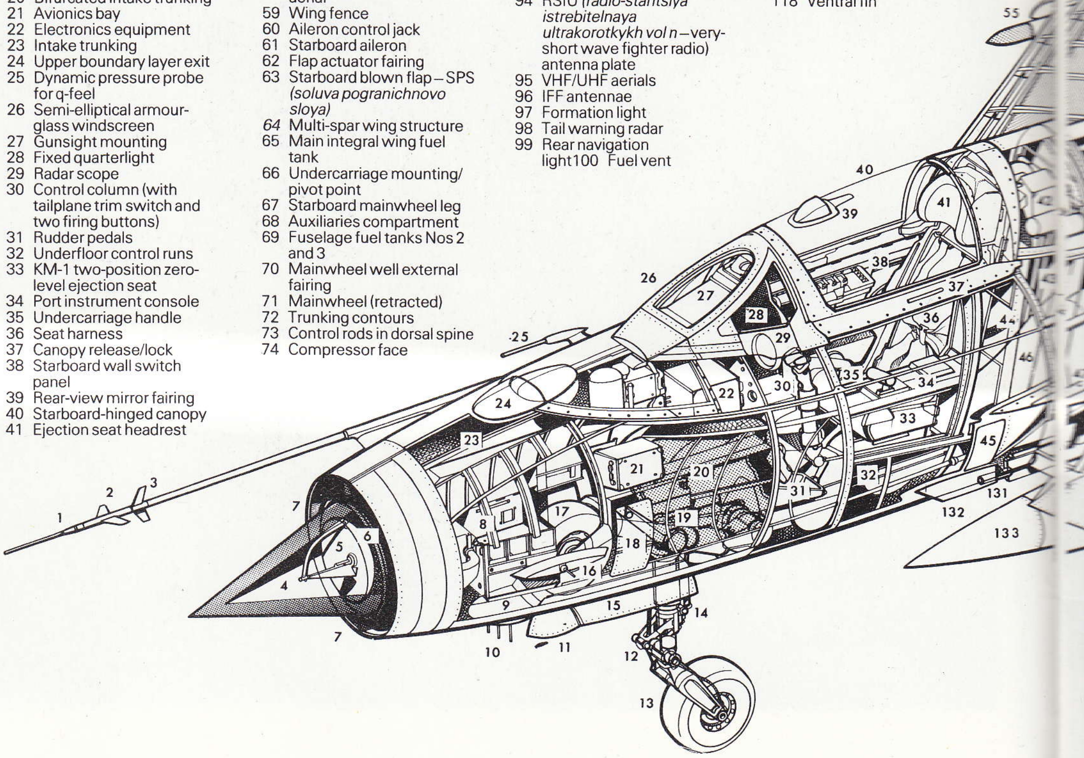
In practice, the MiG-21 pilots were given little opportunity to use their initiative, remaining under strict GCI control throughout an interception. However, the North Vietnamese radar net was most comprehensive, and it was rare for the US forces to take it by surprise. So the MiGs could often be vectored into an ideal position from which to initiate an attack on strike forces, which were often forced to jettison ordnance when faced with such a threat. Those combats which did occur seldom lasted for more than 30 seconds, MiG-21s generally operating in groups of four to six aircraft during the summer of 1966. By the end of that year the North Vietnamese were beginning to learn from earlier fights, and the increasing availability of the 'Atoll' missile meant that many attacks took the form of 'hit-and-run' passes at very high speed (above Mach 1.4), after which the MiGs zoomed to a position of relative safety. This mode of operation was particularly effective in that it exposed the MiG-21 to little risk whilst at the same time offering every chance of disrupting US strike elements.

MiGs fooled by the 8th

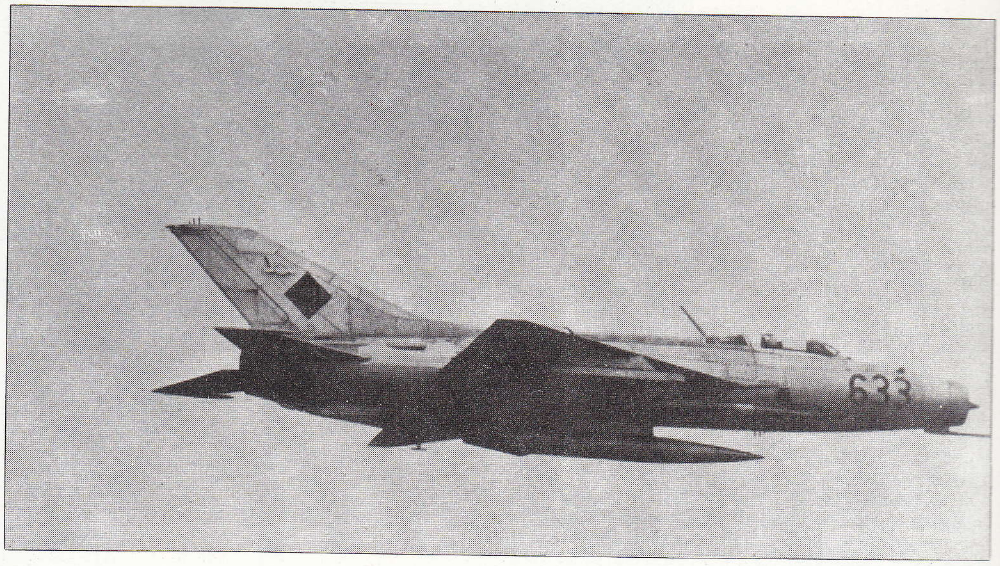
On 2 January 1967, however, the MiG-21s received a rude awakening when attacking what they thought were bomb-laden Republic F-105s but which were in reality missile-armed F-4Cs of the 8th Tactical Fighter Wing, and in just 12 minutes of hectic combat no less than seven MiG-21s fell victim to AIM-7 Sparrow and AIM-9 Sidewinder missiles launched by the Phantoms. This setback led to a period of relative quiet whilst the North Vietnamese licked their wounds, and it was not until early in March that battle was rejoined, the 'hit-and-run' mode of attack eventually forcing the US Air Force to adopt different tactics for its strike echelons and to allocate special flights of F-4 Phantoms to escort duty.

Mikoyan-Gurevich MiG-21MF cutaway drawing key

1 Pitot-static boom
2 Pitch vanes
3 Yaw vanes
4 Conical three-position intake centrebody
5 'Spin Scan' search-and-track radar antenna
6 Boundary layer slot
7 Engine air intake
8 'Spin Scan' radar
9 Lower boundary layer exit
10 Antennae
11 Nosewheel doors
12 Nosewheel leg and shock absorbers
13 Castoring nosewheel
14 Anti-shimmy damper
15 Avionics bay access
16 Attitude sensor
17 Nosewheel well
18 Spill door
19 Nosewheel retraction pivot
20 Bifurcated intake trunking
21 Avionics bay
22 Electronics equipment
23 Intake trunking
24 Upper boundary layer exit
25 Dynamic pressure probe for q-feel
26 Semi-elliptical armour-glass windscreen
27 Gunsight mounting
28 Fixed quarterlight
29 Radar scope
30 Control column (with tailplane trim switch and two firing buttons)
31 Rudder pedals
32 Underfloor control runs
33 KM-1 two-position zero-level ejection seat
34 Port instrument console
35 Undercarriage handle
36 Seat harness
37 Canopy release/lock
38 Starboard wall switch panel
39 Rear-view mirror fairing
40 Starboard-hinged canopy
41 Ejection seat headrest
42 Avionics bay
43 Control rods
44 Air conditioning plant
45 Suction relief door
46 Intake trunking
47 Wingroot attachment fairing
48 Wing/fuselage spar-lug attachment points (four)
49 Fuselage ring frames
50 Intermediary frames
51 Main fuselage fuel tank
52 RSIU radio bay
53 Auxiliary intake
54 Leading-edge integral fuel tank
55 Starboard outer weapons pylon
56 Outboard wing construction
57 Starboard navigation light
58 Leading-edge suppressed aerial
59 Wing fence
60 Aileron control jack
61 Starboard aileron
62 Flap actuator fairing
63 Starboard blown flap – SPS *(soluva pogranichnovo sloya)*
64 Multi-spar wing structure
65 Main integral wing fuel tank
66 Undercarriage mounting/pivot point
67 Starboard mainwheel leg
68 Auxiliaries compartment
69 Fuselage fuel tanks Nos 2 and 3
70 Mainwheel well external fairing
71 Mainwheel (retracted)
72 Trunking contours
73 Control rods in dorsal spine
74 Compressor face
75 Oil tank
76 Avionics pack
77 Engine accessories
78 Tumansky R-13 turbojet (rated at 6600-kg/14,550-lb thrust with full reheat)
79 Fuselage break/transport joint
80 Intake
81 Tail surface control linkage
82 Artificial feel unit
83 Tailplane jack
84 Hydraulic accumulator
85 Tailplane trim motor
86 Fin spar attachment plate
87 Rudder jack
88 Rudder control linkage
89 Fin structure
90 Leading-edge panel
91 Radio cable access
92 Magnetic detector
93 Fin mainspar
94 RSIU *(radio-stantsiya istrebitelnaya ultrakorotkykh vol n* – very-short wave fighter radio) antenna plate
95 VHF/UHF aerials
96 IFF antennae
97 Formation light
98 Tail warning radar
99 Rear navigation light
100 Fuel vent
101 Rudder construction
102 Rudder hinge
103 Braking parachute hinged bullet fairing
104 Braking parachute stowage
105 Tailpipe (variable convergent nozzle)
106 Afterburner installation
107 Afterburner bay cooling intake
108 Tailplane linkage fairing
109 Nozzle actuating cylinders
110 Tailplane torque tube
111 All-moving tailplane
112 Anti-flutter weight
113 Intake
114 Afterburner mounting
115 Fixed tailplane root fairing
116 Longitudinal lap joint
117 External duct (nozzle hydraulics)
118 Ventral fin

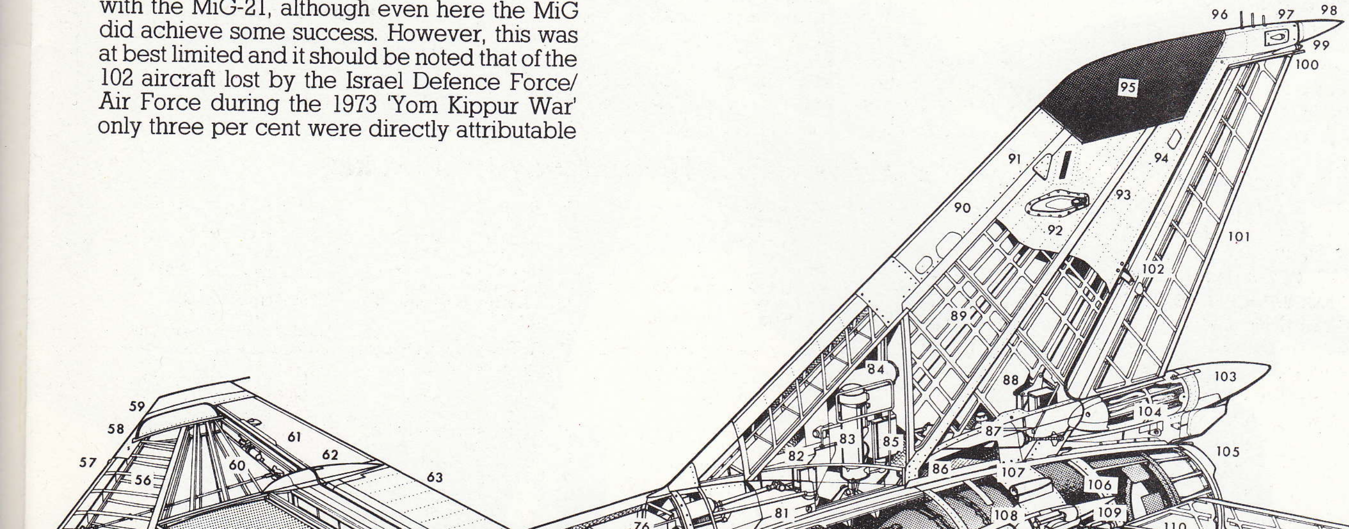


The Warsaw Pact countries were amply equipped with the MiG-21F, and these have been steadily replaced by later MiG-21 models. This MiG-21F of the East German air force typifies hundreds flying in Eastern Europe during the 1960s.



When the 'Rolling Thunder' campaign ended in November 1968 a total of 25 MiG-21s had been claimed by the USAF, several more falling victim to US Navy fighters operating from aircraft-carriers at 'Yankee Station', but the casualties had not all been one-way, MiGs racking up victories against F-105s and F-4s on several occasions. By 1972, US efforts to improve the kill:loss ratio paid handsome dividends, and although some American fighters did fall victim to the MiG-21, no less than 43 of the Soviet-built fighters were claimed as destroyed in little more than 11 months. Clearly, the balance had shifted significantly in favour of the American aircrews.

Several thousand miles away, in the hot-bed of conflict which is the Middle East, Israeli pilots repeatedly emerge as victors in combat with the MiG-21, although even here the MiG did achieve some success. However, this was at best limited and it should be noted that of the 102 aircraft lost by the Israel Defence Force/Air Force during the 1973 'Yom Kippur War' only three per cent were directly attributable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119 Engine guide rail
120 ATO assembly canted nozzle
121 ATO assembly thrust plate forks (rear mounting)
122 ATO assembly pack
123 Ventral airbrake (retracted)
124 Trestle point
125 ATO assembly release solenoid (front mounting)
126 Underwing landing light
127 Ventral stores pylon
128 Mainwheel inboard door
129 Splayed link chute
130 Twin 23-mm GSh-23L cannon installation

131 Cannon muzzle fairing
132 Debris deflector plate
133 Auxiliary ventral drop tank
134 Port forward air brake (extended)
135 Leading-edge integral fuel tank
136 Undercarriage retraction strut
137 Aileron control rods in leading edge
138 Port inboard weapons pylon
139 UV-16-57 rocket pod
140 Port mainwheel
141 Mainwheel outboard door section
142 Mainwheel leg
143 Aileron control linkage
144 Mainwheel leg pivot point
145 Main integral wing fuel tank
146 Flap actuator fairing
147 Port aileron
148 Aileron control jack
149 Outboard wing construction
150 Port navigation light
151 Port outboard weapons pylon
152 K-13A 'Atoll' IR-homing AAM
153 Wing fence
154 Radio altimeter antenna

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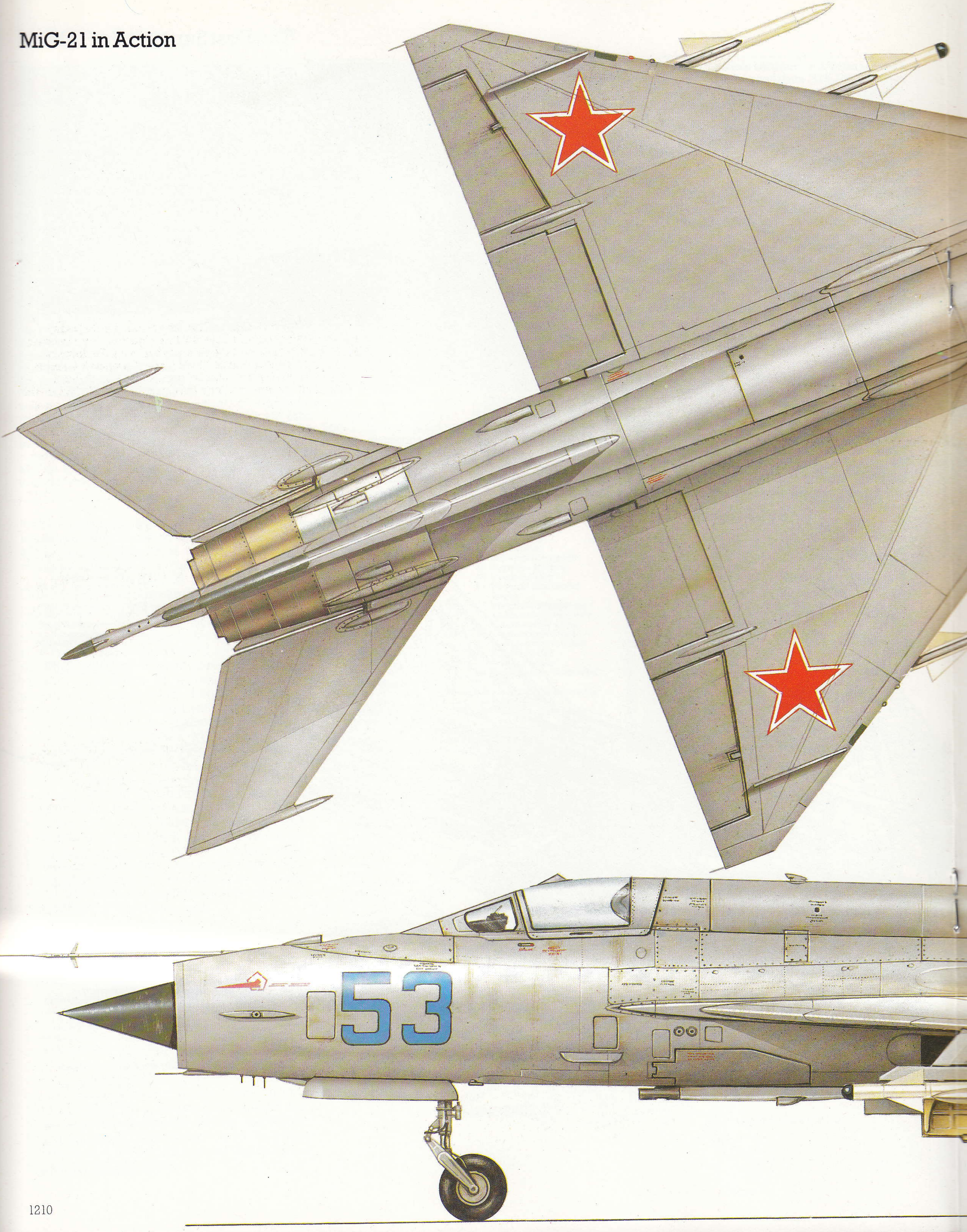
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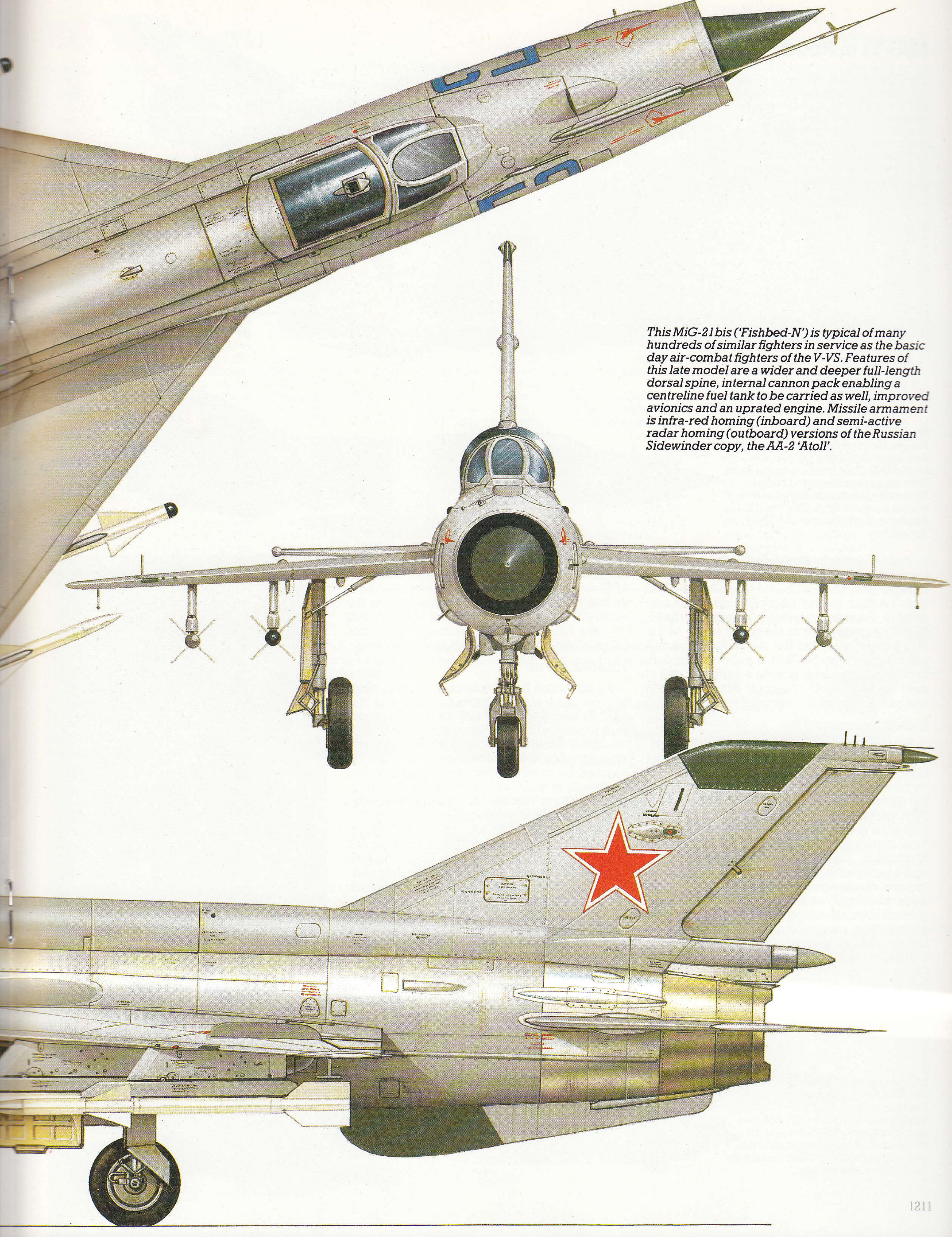
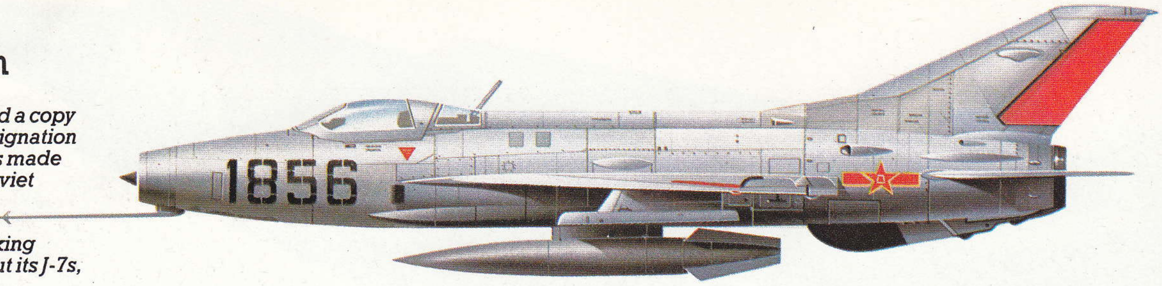
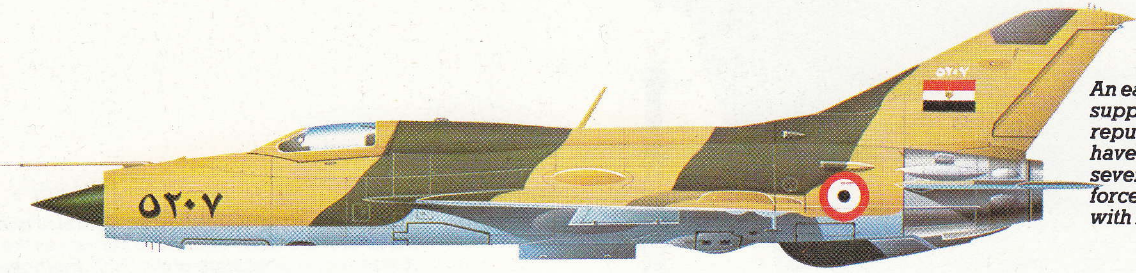


This MiG-21bis ('Fishbed-N') is typical of many hundreds of similar fighters in service as the basic day air-combat fighters of the V-VS. Features of this late model are a wider and deeper full-length dorsal spine, internal cannon pack enabling a centreline fuel tank to be carried as well, improved avionics and an uprated engine. Missile armament is infra-red homing (inboard) and semi-active radar homing (outboard) versions of the Russian Sidewinder copy, the AA-2 'Atoll'.

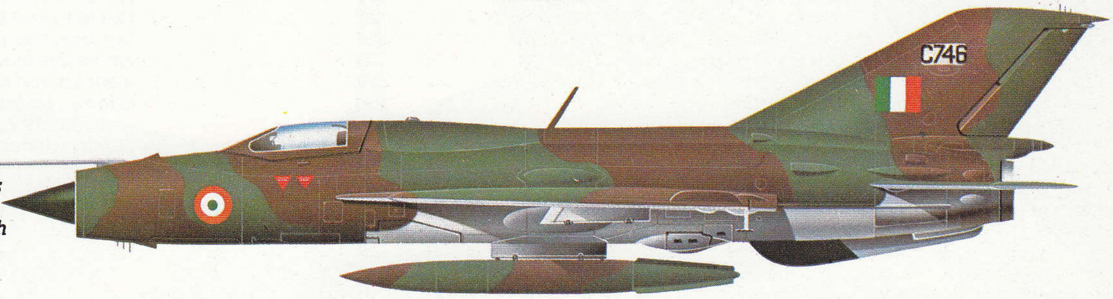
MiG-21 in Action



The Chinese have produced a copy of the MiG-21F with the designation Shenyang J-7. The copy was made without any drawings or Soviet assistance and many local modifications have beer incorporated. China is seeking Western equipment to fit out its J-7s, as well as other fighters.



An early MiG-21PF 'Fishbed-D' as supplied to the air force of the Arab republic of Egypt. These aircraft have been widely used by Egypt in several actions against the Israeli air force, where the MiG often fought with its old rival, the F-4 Phantom.



The MiG-21 has been the subject of the biggest aviation programme in Asia since that of the Japanese in World War II. At least seven versions have been manufactured under licence by Hindustan Aerospace with Indian designations. This is an FL, known to the Indians as the MiG Type 77.

to enemy aircraft. Perhaps the most startling proof of Israeli superiority is provided by the kill:loss ratio, claimed better than 100:1, no less than 334 Arab aircraft being shot down in aerial combat. Even the diminutive Douglas Skyhawk (hardly a dogfighter in the truest sense of the term) found itself on the scorecard, one A-4 pilot claiming two MiGs in a single combat only to be prevented from getting a third by a pair of over-eager IDF/AF Dassault Mirages which stepped in just as he was lining up for the kill.

Indian successes

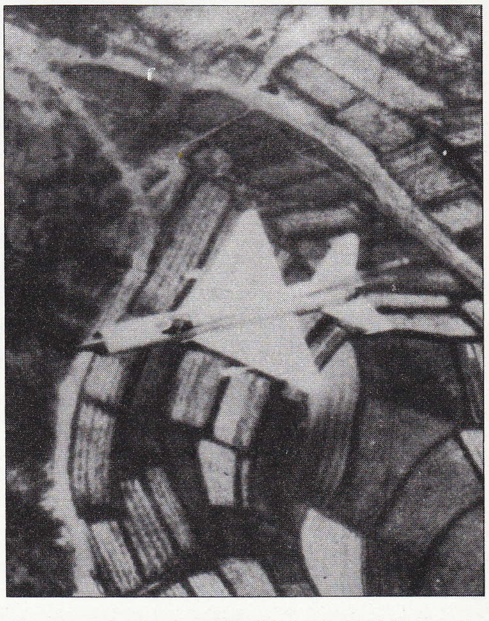
In Indian service, the picture is rather different, probably because the disparity in pilot skill between the Indians and the Pakistanis is by no means so great. In conflict against Pakistan during 1971, the MiG-21 performed well in both ground-attack and air-superiority tasks, gaining a number of kills of which perhaps the most significant was that of a Lockheed F-104 Starfighter. Designed with pretty much the same purpose in mind and largely to the same criteria, these two types are true contemporaries and both were, in the course of their service lives, developed into far more capable aircraft than was originally the case.

The variant responsible for downing the F-104A on 12 December 1971 was a MiG-21FL (known as the Type 77 in Indian service), and the encounter took place in the vicinity of Sikka, the victim being part of a force of marauding Pakistani aircraft. After a brief chase in afterburner at low level, the No. 47 Squadron MiG was able to bring its guns to bear and the ensuing burst of cannon fire resulted in the Starfighter crashing into the Gulf of Kutch after its pilot had ejected. A second F-104A also succumbed to the MiG-21 at a later date.

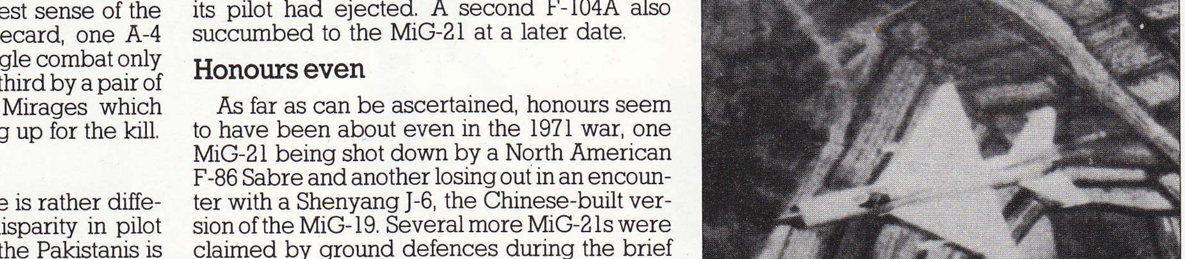
Honours even

As far as can be ascertained, honours seem to have been about even in the 1971 war, one MiG-21 being shot down by a North American F-86 Sabre and another losing out in an encounter with a Shenyang J-6, the Chinese-built version of the MiG-19. Several more MiG-21s were claimed by ground defences during the brief two-week conflict, but perhaps the most intriguing casualty was the MiG-21 which was shot down by an 'Atoll' missile fired by the section leader in another MiG-21; this tragic mishap apparently occurred during an attempted night interception of a Mirage IIIRP engaged on a reconnaissance sortie, the latter duly making good its escape at high speed during the ensuing confusion.

Although it has generally come off worse in air-to-air combat, the MiG-21 is nevertheless a most formidable opponent when flown skilfully, but perhaps its greatest contribution to the saga of air power is that it made genuine Mach 2 capability available at modest cost to many of the less significant air arms in the world today.



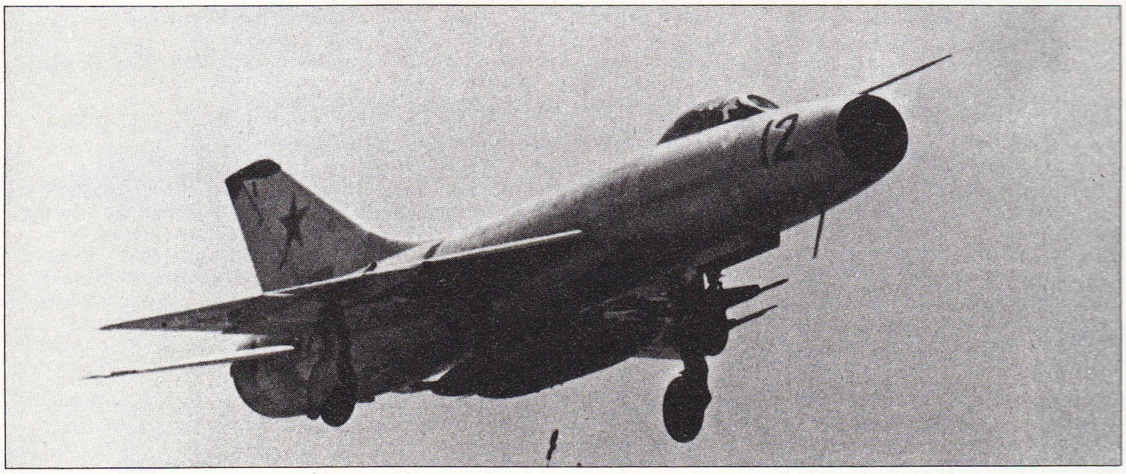
Photographed from a USAF jet, this MiG-21 is in the service of the North Vietnamese, who flew the aircraft alongside the MiG-17 and MiG-19 under tight ground-control against US strike aircraft attacking the North. They achieved many successes but were far from immune to attack themselves.



India received MiG-21s direct from the Soviet Union as well as licence-building others. This MiG-21PF 'Fishbed-D' carries a GSh-23L gun pod and a pair of K-13A air-to-air missiles. The camouflage scheme was haphazardly applied during the 1971 Indo-Pakistan war.

USSSR

Sukhoi Su-9/11



First supersonic interceptor in the Soviet inventory with limited all-weather capability, the Sukhoi Su-9 served in large numbers. It is now out of service, along with the Su-11 improved model.

Never as widely used or as well known as the contemporary Mikoyan-Gurevich MiG-21 'Fishbed' or Su-7 'Fitter-A', the Sukhoi bureau's delta-wing prototype of 1955-6 nevertheless led to the Su-9 'Fishpot-B', the most numerous supersonic interceptor in the PVO (Air Defence Forces) fleet for many years. The type was supplanted by the Su-15 'Flagon' on the production lines in the late 1960s, but some 600 remained in service throughout the 1970s.

The Su-9 was designed as an all-weather fighter based on the same tailed-delta configuration as the MiG-21. Entering service in 1958-59, it typified Soviet practice in that it combined a new engine and airframe with an existing weapon, the K-5M 'Alkali' air-to-air missile already in service on the MiG-19PFM 'Farmer'. The small radar fitted quite simply into the nose of the Su-9, which was closely similar to that of the Su-7. However, the all-weather capability of the Su-9 was fairly limited, as this radar lacks search range. In practice, the type certainly operated in close co-operation with ground control.

The 1961 Tushino air display, however, saw the appearance of a new derivative of the basic type, featuring a longer and less tapered nose. The inlet diameter was considerably larger, and there was a proportionate increase in the size of the centre-body radome to accommodate a new and more powerful radar known to NATO as 'Skip Spin'. The new type replaced the Su-9 on the production lines, and was designated Su-11, with the code-name 'Fishpot-C'; it appears to be Soviet practice to apply new designations to reflect relatively minor changes, the Su-11 being no more different from its predecessor than some MiG-21 versions differ from others.

A measure of the comparative worth of the 'Alkali' and later 'Anab' missiles is the fact that the Soviet air force was prepared to accept two of the more potent later weapons on the Su-11 in place of four 'Alkalis' on the Su-9. It is probable that, like many first-generation missile systems, the performance of the K-5M *Izumrud* system was barely good enough for operational clearance. The 'Anab' has clearly been more successful, and has remained in service and under development for many years.

Like most Soviet interceptors, the Su-9/11 series has never been exported, even to the Warsaw Pact.

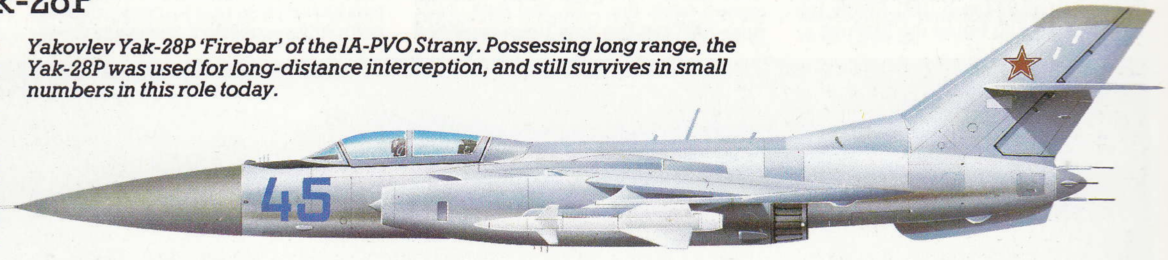
Specification

Type: all-weather interceptor
Powerplant: one 10000-kg (22,046-lb) afterburning Lyulka AL-7F turbojet
Performance: maximum (clean) 2250 km/h (1,398 mph), or Mach 2.1; maximum speed with two AAMs and external fuel tanks 1600 km/h (994 mph) or Mach 1.5; service ceiling 20000 m (65,615 ft); range about 1125 km (699 miles)
Weights: empty 9000 kg (19,842 lb); maximum loaded 13500 kg (29,873 lb)
Dimensions: span 8.43 m (27 ft 8 in); length (including instrument boom) 18.3 m (60 ft); height 4.9 m (15 ft); wing area 26.2 m^2 (282 sq ft)
Armament: (Su-9) four K-5M (AA-1 'Alkali') beam-riding air-to-air missiles on wing pylons; (Su-11) two AA-3 'Anab' semi-active homing (almost certainly) AAMs

USSSR

Yakovlev Yak-28P

Yakovlev Yak-28P 'Firebar' of the IA-PVO Strany. Possessing long range, the Yak-28P was used for long-distance interception, and still survives in small numbers in this role today.

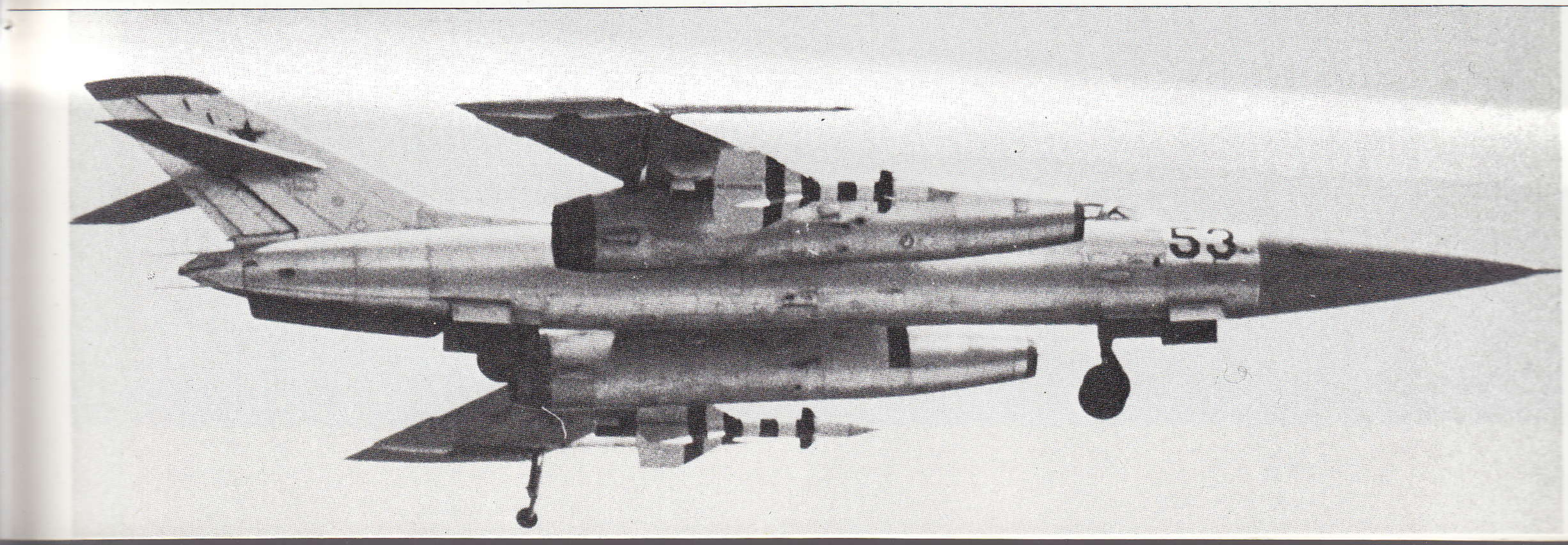


Alexander Yakovlev's Yak-28 family of combat aircraft, similar in concept and performance to the French Sud-Ouest Vautour series, continue to fill an important role in the Soviet air arm, although the numbers in service are declining. The last to be retired will be the 'Brewer-E' ECM aircraft, with some Yak-28P 'Firebar-Es' carrying on in less strategically important areas of the Soviet periphery.

The current Yak-28s are direct descendants of the original Yak-25, developed from 1950 as the Soviet Union's first all-weather jet fighter. The layout of the Yak-25, with engines under the swept wings, was most unusual and followed wartime German studies; it was one of the first aircraft to feature a 'zero-track tricycle' undercarriage, with a single twin-wheel main unit on the centre of gravity and single nose and outrigger wheels. Like the Mikoyan-Gurevich MiG-19, the Yak-25 was powered by Mikulin AM-5 engines, which eventually were manufactured by Tumansky and became the RD-9. Developments of the Yak-25 included the Yak-25RD 'Mandrake', Yak-26 and Yak-27 'Mangrove'.

The Yak-28 series bears little relationship to these earlier aircraft, beyond a general similarity in configuration. Initially, the Yak-28 seems to have been developed as a transonic all-weather fighter using two of the Tumansky R-11 turbojets developed for the MiG-21. The Yak-28's wing is more sharply swept than that of its predecessors and is raised from the mid to the shoulder position. The landing gear has a true bicycle layout, leaving space for a large weapons bay between the main units. On the Yak-28P interceptor this space is used for fuel;

***Below:** Displaying its futuristic layout, this Yak-28P prepares to land. The bicycle main undercarriage with wingtip outriggers was a notable feature of the type. The missiles are AA-3 'Anabs'.*



the strike version carries stores in the internal bay, and drop tanks on underwing stations.

Deliveries of the Yak-28P 'Firebar' started in 1962, and the type is still widely used by the PVO air-defence force. It offers slightly better endurance than the Sukhoi Su-15, which has similar engines but is lighter and much faster. Later Yak-28Ps, seen from 1967, have sharper and much longer nose radomes and provision for AA-2 'Atoll' short-range missiles on additional underwing pylons.

Developed in parallel with the Yak 28P was a glazed-nose strike version with a second crew member seated ahead of the pilot and a bombing-navigation radar aft of the nose landing gear. Originally codenamed 'Firebar' by NATO, the type was re-christened 'Brassard' when its bomber role became obvious, and the reporting name was then changed to 'Brewer' to avoid confusion with the French Holste Broussard. Because the designations 'Firebar-A' and 'Firebar-B' had already been allotted, the 'Brewer' series appears to have started as 'Brewer-C'.

Specification

Type: Yak-28P 'Firebar' all-weather interceptor; Yak-28U 'Maestro' two-seat conversion trainer
Powerplant: two 6000-kg (13,228-lb) Tumansky R-11 afterburning turbojets
Performance: maximum speed at medium altitude 1200 km/h (746 mph) or Mach 1.13; maximum speed at sea level Mach 0.85; service ceiling 17000 m (55,775) ft
Weights: empty 13600 kg (29,982 lb); maximum loaded 20000-22000 kg (44,092-48,502 lb)
Dimensions: span 12.95 m (42 ft 6 in); length (except late 'Firebar') 21.65 m (71 ft); length (late 'Firebar') 23.17 m (76 ft); height 3.95 m (13 ft)
Armament: ('Firebar C') two AA-3 'Anab' air-to-air missiles and, on some aircraft, two AA-2 'Atoll' air-to-air missiles

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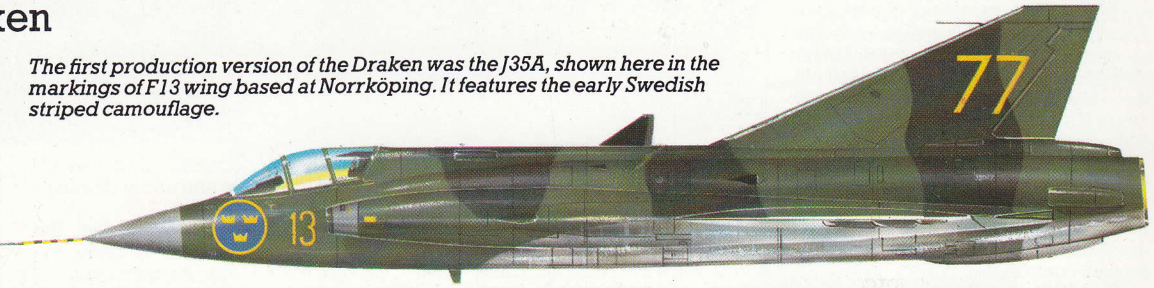
SWEDEN

Saab 35 Draken



The first production version of the Draken was the J35A, shown here in the markings of F13 wing based at Norrköping. It features the early Swedish striped camouflage.

One of several classic fighters which originated in Europe at around the same time, the highly distinctive double-delta **Saab 35 Draken** (dragon) is still extensively used by the Swedish air force (Flygvapen) and also serves with Finland and Denmark in some numbers.

Arising in response to a 1949 specification calling for a single-seat all-weather interceptor capable of operation from relatively short and austere airstrips, the Draken prototype flew for the first time on 25 October 1955, this event having preceded by a series of trials with the much smaller Saab-210 in order to explore handling characteristics of what was then a unique wing planform.

Several pre-production aircraft also took part in the flight test programme from early 1958 but by this time the Draken was well established in production, an initial order for the **J35A** being placed during the summer of 1956. Deliveries to the Flygvapen got under way on 8 March 1960, Flygflottilj 13 at Norrköping being the first unit to convert from the J29, and this was quickly followed by F16 at Uppsala.

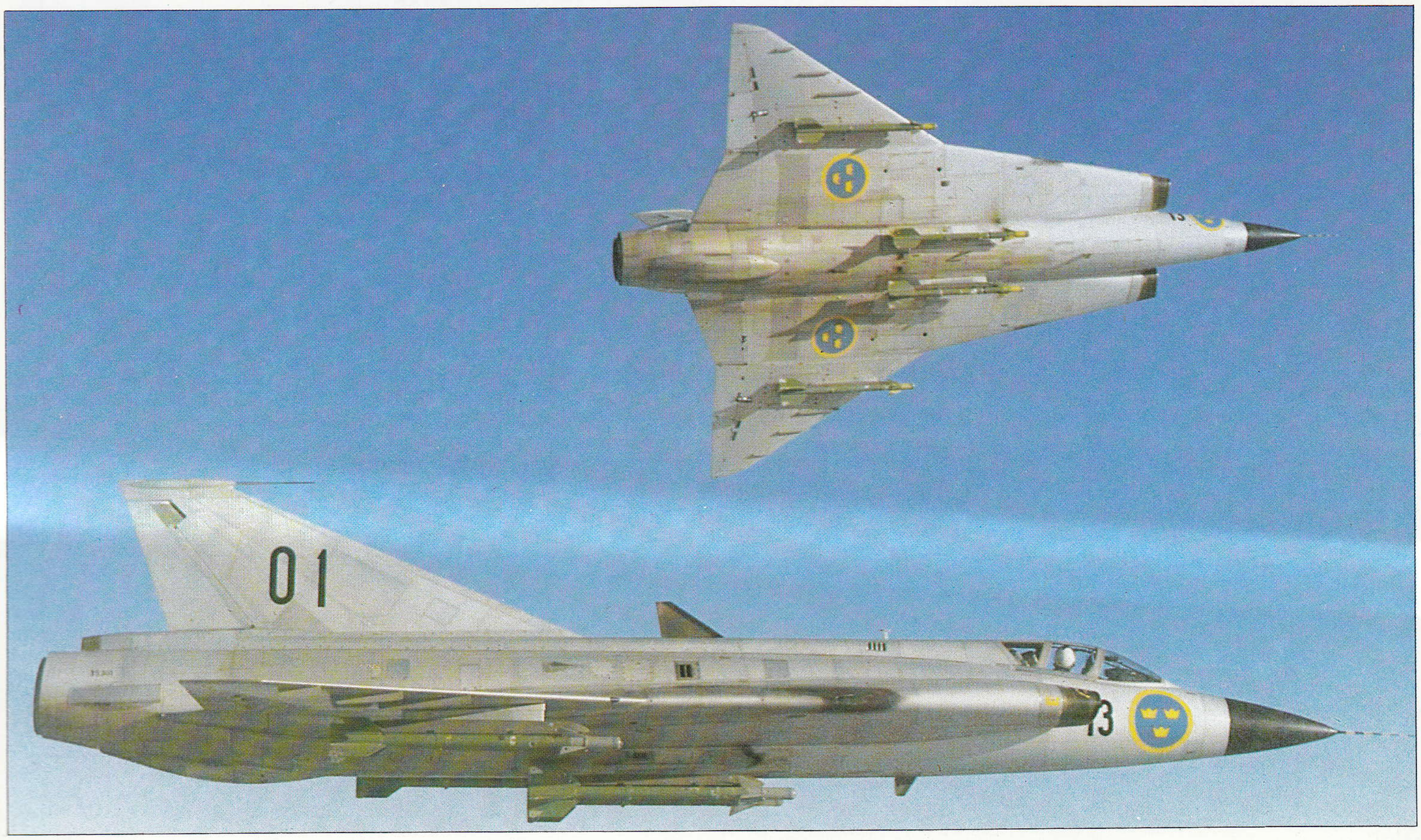
Refinement of the fire control system resulted in the appearance of the **J35B** (many of the original J35As being progressively modified to this standard), deliveries taking place from 1961. The next single-seat variant was the **J35D** which was essentially similar to the J35B apart from incorporating a rather more powerful version of the licence-built Rolls-Royce Avon engine, and this was followed by the **S35E** for reconnaissance duties. Fitted with a battery of cameras in an extensively redesigned nose, the S35E first flew on 27 June 1963 but has now been replaced by the SF37 and SH 37 Viggen.

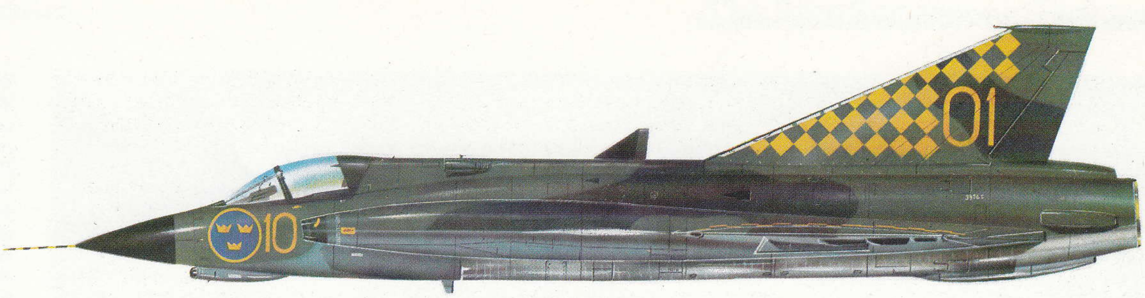
The most capable variant of the Draken, and incidentally the most numerous, was the **J35F** which entered service during 1965-6, relying on licence-built radar and infra-red homing versions of the Hughes Falcon.

In addition to the single-seaters already described, one two-seat model also attained quantity production for the Flygvapen, this being the **Sk35C** used for operational training.

Although Saab made repeated strenuous attempts to find export customers, it was not until shortly before production was due to cease that the company succeeded in securing overseas orders, Denmark purchasing fighter-bomber, reconnaissance and trainer versions of the **Saab-35X** export variant. Finland also opted to buy the Draken, acquiring 12 **J35Xs** interceptors which it presently operates alongside a number of former Swedish air force J35Bs, J35Fs and Sk35Cs.

A pair of J35Ds from F13 wing display the distinctive lines of this fine aircraft. The dark smudges on the leading edges of the wings mark the position of the two internal cannon. The missiles carried are licence-built Sidewinders.





Specification

Saab J35F Draken

Type: single-seat all-weather interceptor

Powerplant: one Svenska Flygmotor RM6C turbojet rated at 8000-kg (17,637-lb) afterburning thrust

Performance: maximum speed 2125 km/h (1,320 mph) at 12200 m (40,025 ft); initial climb rate 10500 m (34,450 ft) per minute; service ceiling about 19800 m (64,960 ft); ferry range 3250 km (2,020 miles) with maximum external fuel

Weights: empty 8245 kg (18,177 lb); maximum take-off 12270 kg (27,050 lb)

Dimensions: span 9.40 m (30 ft 10 in); length 15.35 m (50 ft 4 in) including probe; height 3.89 m (12 ft 9 in); wing area 49.20 m^2 (529.6 sq ft)

Armament: one 30-mm Aden cannon and two RB27 Falcon radar-homing air-to-air missiles plus two RB28 Falcon infra-red homing air-to-air missiles, or a combination of these missile type with the RB24 Sidewinder infra-red homing air-to-air missile

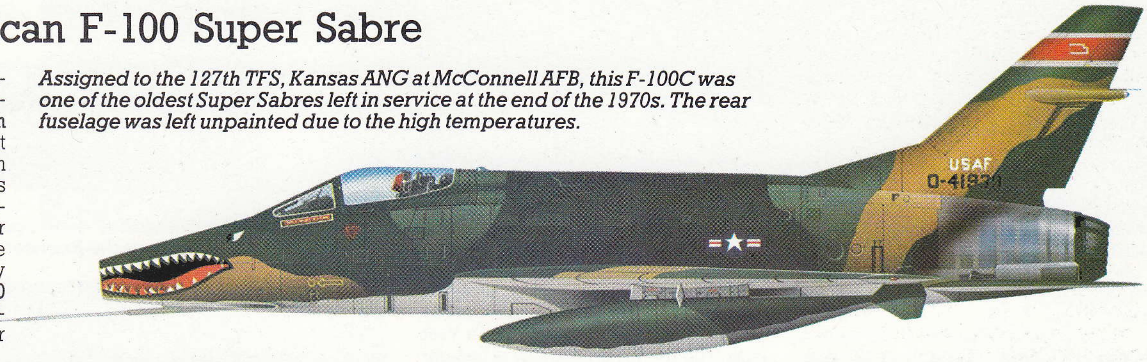
The final interceptor version of the Draken is the J35F, which features much improved avionics. It is easily distinguished from earlier marks by the infra-red seeker under the nose.

USA

North American F-100 Super Sabre

The first example of the classic 'Century-series' of fighters to attain operational status, the **North American F-100 Super Sabre** is perhaps most noteworthy for being the first fighter in the world after the MiG-1G to possess genuine supersonic performance. Providing the backbone of US tactical air power for several years during the late 1950s and early 1960s, it is now used by the US Air Force only as the **QF-100** target drone, although a number of F-100s remain operational with the air arms of Taiwan and Turkey.

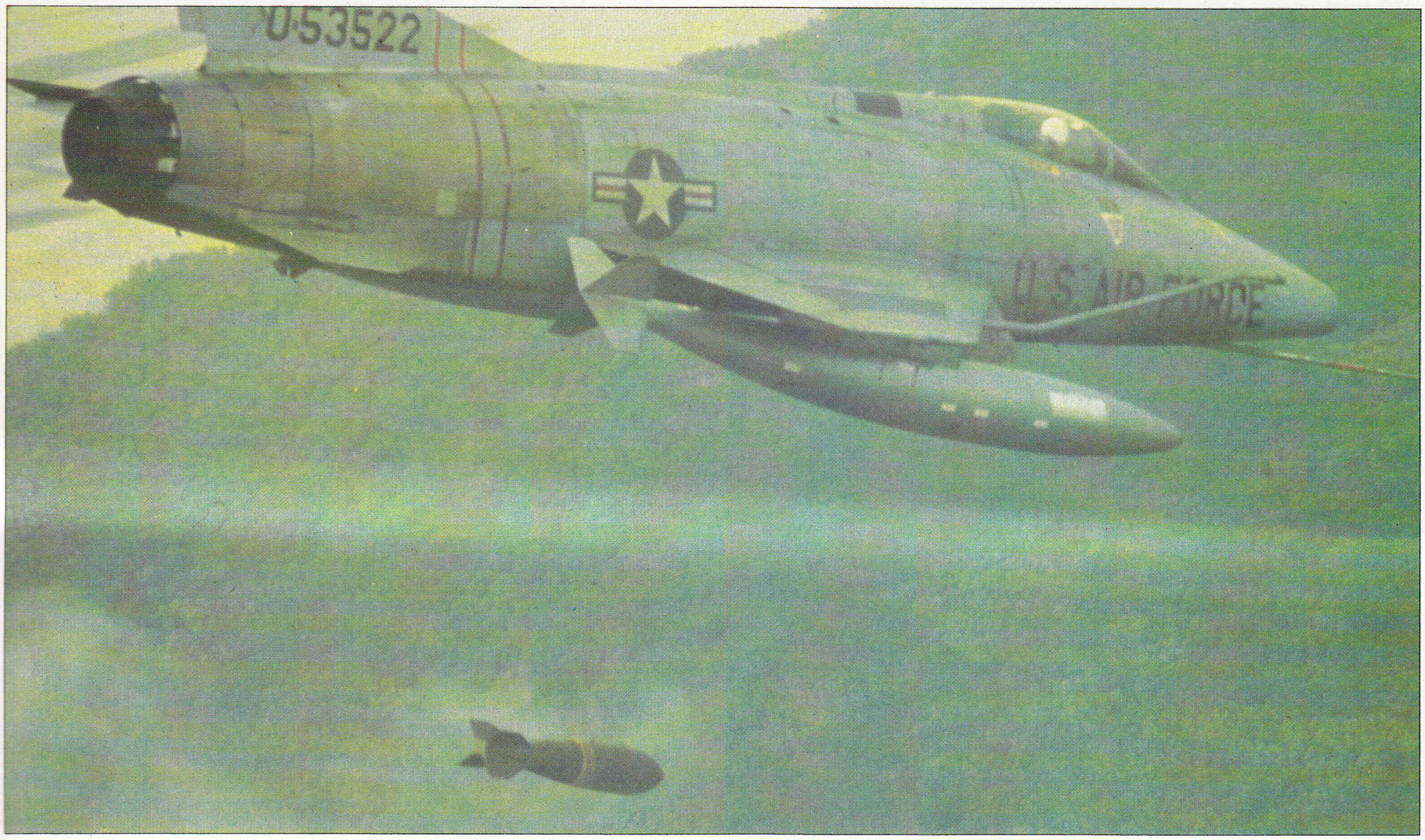
Assigned to the 127th TFS, Kansas ANG at McConnell AFB, this F-100C was one of the oldest Super Sabres left in service at the end of the 1970s. The rear fuselage was left unpainted due to the high temperatures.



Begun as a development of North American's highly successful F-86, the F-100 was initially known by that company as the Sabre-45, this appellation referring to the degree of wing sweep, and development of the type began in early February 1949. North American's enterprise was rewarded with a contract for a pair of prototypes and 110 production specimens in November 1951, and the first **YF-100A** made a successful maiden flight on 25 May 1953. Production-configured **F-100A** aircraft began to join the test programme in mid-October of the same year, and the Super Sabre subsequently entered service less than a year later, on 27 September 1954, when the 479th Fighter Day Wing at George AFB, California, received its first aircraft.

Thus far, development had progressed smoothly, but then a series of mysterious crashes occurred during 1954, these eventually leading to the F-100 being grounded during November whilst investigations were made into the cause of the accidents. It later became clear that under certain conditions roll-coupling was taking place, and the main cure was the fitting of extended wingtips; this and other changes were retrospectively applied to the first 70 F-100As.

An F-100D drops a bomb on a Viet Cong target in South Vietnam. As well as South East Asia, the 'Hun' also saw combat with the Turkish forces over Cyprus.



North American F-100 Super Sabre (continued)

Production then switched to the **F-100C** model, which made its first flight in January 1955 and which had greater payload capability. Entering service first with the 450th Fighter Day Wing in July 1955, 476 F-100Cs were completed, these being followed by the definitive **F-100D** which featured a number of detail design improvements, including inboard landing flaps and modified vertical tail surfaces. No less than 1,274 F-100Ds were built between 1955 and 1959, and this model subsequently saw extensive service as a fighter-bomber in Vietnam.

The only other significant variant to appear was the two-seat **F-100F** combat proficiency trainer, first flown on 7 March 1957 and of which no less than 339 had been built by the time production ceased in 1959. A small number later served as 'Wild Weasel' SAM-a suppression aircraft in South East Asia although they were soon replaced by Republic F-105F Thunderchiefs.

Specification

North American F-100D Super Sabre

Type: single-seat fighter bomber

Powerplant: one Pratt & Whitney J57-P-21A turbojet rated at 5307-kg (11,700-lb) dry thrust and 7689-kg (16,950-lb) afterburning thrust

Performance: maximum speed 1390 km/h (864 mph) at 10970 m (36,000 ft); initial climb rate 4875 m (16,000 ft) per minute; service ceiling 13715 m (45,000 ft); combat radius (clean) 885 km (550 miles); ferry range 2415 km (1,500 miles) with drop tanks

Weights: empty 9526 kg (21,000 lb); normal loaded 13500 kg (29,762 lb); maximum take-off 15800 kg (34,832 lb)

Dimensions: span 11.81 m (38 ft 9 in); length 16.54 m (54 ft 3 in) including probe; height 4.96 m (16 ft 2¾ in); wing area 35.77 m^2 (385 sq ft)

Armament: four 20-mm Pontiac M39E cannon, plus up to 3193 kg (7,040 lb) of external ordnance including bombs, rockets and napalm

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USA

McDonnell F-101 Voodoo

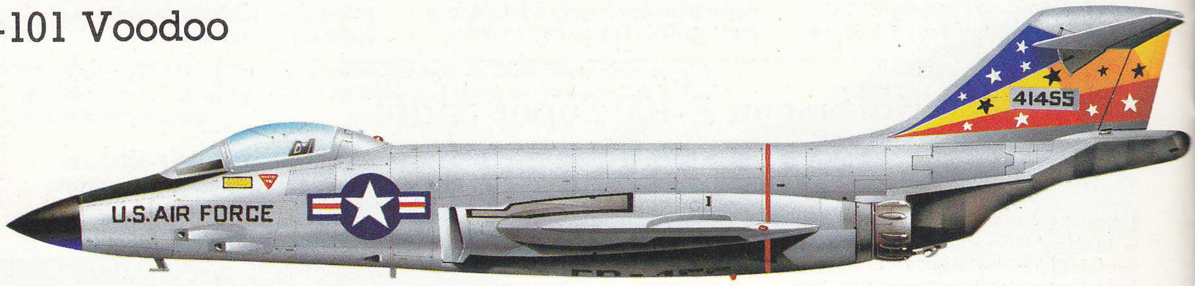
Although its designation indicates that the **McDonnell F-101 Voodoo** was the second of the 'Century-series' fighters to make an appearance, development of this type in fact predated that of the F-100 and can be traced back to the summer of 1946, when McDonnell began work on a strategic penetration fighter to escort bomber aircraft of the Strategic Air Command. Initially known as the **XF-88** and first flown in prototype form during October 1948, McDonnell's original proposal was cancelled in August 1950 only to be reborn in the following year as the F-101.

Again, it was intended to serve as a strategic fighter, a batch of 29 pre-production machines being ordered in May 1953, but SAC soon lost interest in the requirement and subsequently cancelled it at the end of September 1954. By then, however, Tactical Air Command had begun to show interest and development was allowed to continue, the first pre-production **F-101A** flying on 29 September 1954.

At this time, the type was intended as a fighter-bomber, but early flight trials revealed numerous deficiencies including a serious tendency to 'pitch up' and enter an uncontrollable spin. Work on eradicating these failings eventually achieved the desired result, but it was not until May 1957 that the F-101A entered service with the 27th Fighter-Bomber Wing at Bergstrom AFB. Ultimately, the F-101A and the basically similar **F-101C** joined USAFE's 81st Tactical Fighter Wing, remaining in use until about 1965 when the survivors were modified to reconnaissance configuration as the **RF-101G** and **RF-101H** respectively and issued to the Air National Guard.

In addition to fighter-bomber models, a substantial number of Voodoos were built from the outset for reconnaissance tasks, 35 **RF-101A** aircraft being followed by 166 **RF-101C** machines, and these two variants enjoyed a lengthy operational career, seeing extensive combat duty in Vietnam. The RF-101 airframe was basically similar to that of the earlier fighter-bomber apart from the modified nose section which housed a battery of cameras.

The most numerous variant of the Voodoo was the two-seat **F-101B** interceptor, which made its maiden flight on 27 March 1957, a total of 480 eventually being built for service with Air Defense Command although 66 of these were transferred in 1961 to what was then the Royal Canadian Air Force. Retired from the operational USAF inventory in the early 1970s, some F-101Bs remained active with the Air National Guard until 1982, whilst the Canadian Armed Forces are replacing their CF-101Bs by CF-18s.



Originally planned as an escort fighter for Strategic Air Command, the F-101A soon passed to TAC and then to Europe, where this aircraft is seen in the colours of the 81st TFW based at Bentwaters and Woodbridge in England.

One of the first US jet aircraft to go to Vietnam was the RF-101C, the only Voodoo model to serve in that theatre. These were the prime reconnaissance platforms for the USAF in the early years.

Specification

McDonnell F-101B Voodoo

Type: two-seat all-weather interceptor

Powerplant: two Pratt & Whitney J57-P-55 turbojets, each rated at 5439-kg (11,990-lb) dry thrust and 6799-kg (14,990-lb) afterburning thrust

Performance: maximum speed 1963 km/h (1,220 mph) at 12190 m (40,000 ft); initial climb rate 5180 m (17,000 ft) per minute; service ceiling 15545 m (51,000 ft); maximum range 2495 km (1,550 miles)

Weights: empty 13141 kg (28,970 lb); normal loaded 18099 kg (39,900 lb); maximum take-off 23462 kg (51,724 lb) on an area interception mission

Dimensions: span 12.09 m (39 ft 8 in); length 20.55 m (67 ft 4¾ in); height 5.49 m (18 ft 0 in); wing area 34.19 m^2 (368 sq ft)

Armament: two AIR-2A nuclear-tipped unguided air-to-air rockets and two AIM-4C infra-red homing air-to-air missiles

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USA

Convair F-102 Delta Dagger

Capitalizing to a great degree on wartime German research and early post-war experience gained with the experimental XF-92A, the **Convair F-102 Delta Dagger** was unique in being the first supersonic delta-winged aircraft to enter operational service.

This was an ambitious project from the outset, and development which began in earnest in 1950 was plagued by numerous problems, not least of which was the fact that in its original form it was clear that the type would never exceed Mach 1, one of the prime features of the requirement.

The type was first flown on 24 October 1953 in prototype form as the **YF-102**, but early trials were marred by the loss of the initial machine and by the realization that drastic redesign would be necessary, the parent company eventually having no option but to return to the drawing board and incorporate the then-new concept of area rule which seemed to offer the best chance of reducing unacceptably high transonic drag. In the event, adoption of the so-called 'coke bottle' fuselage lines satisfactorily resolved the performance question although further major redesign was necessary with regard to the vertical tail and air inlet ducting, so it was not until April 1956 that the type entered service with Air Defense Command.

Subsequently, the **F-102A** enjoyed a lengthy operational career, serving as an interceptor with ADC, Pacific Air Forces and United States Air Forces in Europe, 875 of the 889 single-seaters built eventually joining the active inventory. In addition, 111 examples of the two-seat **TF-102A** combat proficiency trainer were also completed, this rather unusually adopting side-by-side seating arrangement in a completely new forward fuselage section.

Retired from service as an interceptor with the Air National Guard during the latter half of the 1970s, the Delta Dagger gained a new lease of life as the **PQM-102** target drone, several hundred being converted for use in weapons training and trials programmes.

Specification

Convair F-102A Delta Dagger

Type: single-seat all-weather interceptor

Powerplant: one Pratt & Whitney J57-P-23 turbojet rated at 5307-kg (11,700-lb) dry thrust and 7802-kg (17,200-lb) afterburning thrust
Performance: maximum speed (clean) 1328 km/h (825 mph) at 12190 m (40,000 ft); initial climb rate 5305 m (17,400 ft) per minute; service ceiling 16460 m (54,000 ft) tactical radius 805 km (500 miles) with external fuel and full armament
Weights: empty 8641 kg (19,050 lb); normal loaded 12565 kg (27,700 lb); maximum take-off 14288 kg (31,500 lb)
Dimensions: span 11.62 m (38 ft 1½ in); length 20.84 m (68 ft 4⅔ in) including probe; height 6.46 m (21 ft 2½ in); wing area 61.45 m^2 (661.5 sq ft)
Armament: various combinations of AIM-4C Falcon infra-red homing air-to-air missiles, AIM-4A/AIM-4E Falcon radar homing air-to-air missiles, and AIM-26A Falcon nuclear-tipped air-to-air missiles in an internal weapons bay

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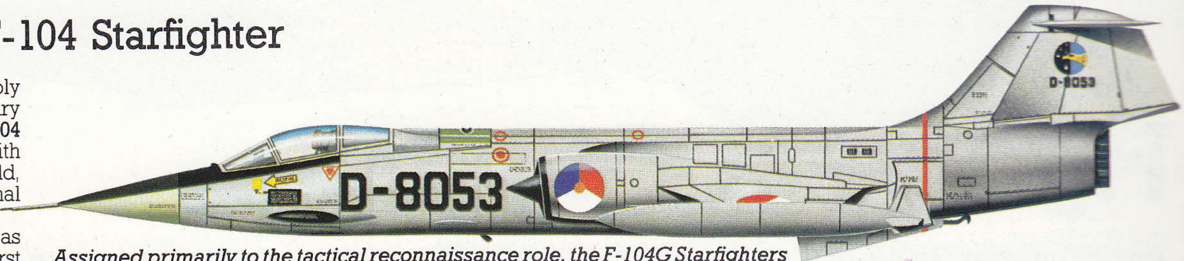
These two F-102As are typical of the aircraft which defended the continental United States for several years. Later these were converted to drones.

USA

Lockheed F-104 Starfighter



Assigned primarily to the tactical reconnaissance role, the F-104G Starfighters of the Netherlands' No. 306 Sqn carry optical cameras and Oude Delft infra-red linescan systems.

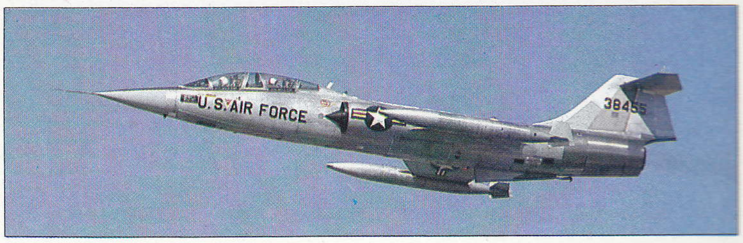
The most widely used, and possibly best-known, member of the 'Century series', the diminutive **Lockheed F-104 Starfighter** is still in service today with several air arms throughout the world, although its days as an operational fighter are now clearly numbered.

Intended initially to serve purely as a day superiority fighter, the type first flew in prototype form on 7 February 1954 and like most of its contemporaries it suffered from numerous teething troubles, no less than 52 Starfighters being involved in the test programme at one time. In the event, most of these difficulties were overcome and the **F-104A** entered service with the USAF's 83rd Fighter Interceptor Squadron shortly before the end of January 1958, only to be grounded in April following a series of engine-related accidents. Re-engining with the J79-GE-3B went some way towards resolving these problems, but the type's generally poor safety record and short range resulted in it disappearing from the US front-line inventory in 1960, most surviving F-104As being issued to the Air National Guard.

The first multi-mission model was the **F-104C**, which served with Tactical Air Command for several years and which incorporated inflight-refuelling equipment as well as the ability to carry a range of stores on two underwing stations. In the event only 77 F-104Cs were built, these being the last Starfighters to be used operationally by the USAF; some undertook combat in South East Asia, although their contribution was small. Two-seat equivalents of the F-104A and F-104C were the **F-104B** and **F-104D** respectively, a combined total of 47 being produced.

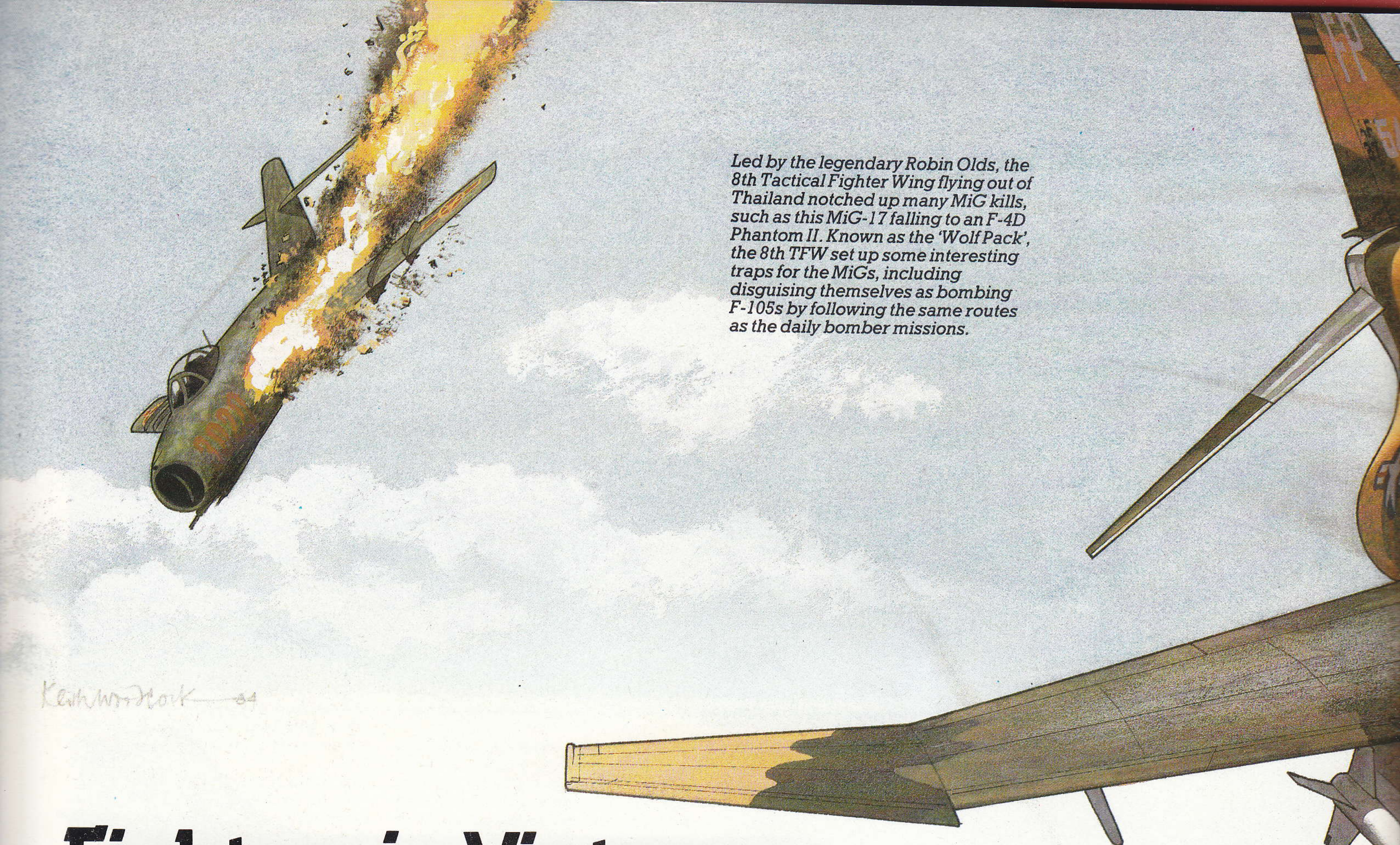
The definitive Starfighter was the **F-104G**, which is a true multi-mission machine with sophisticated radar optimized for air-to-air and air-to-ground modes. Development of this variant began in 1958 and it subsequently secured substantial orders from European members of the NATO alliance as well as from Canada (as the **CF-104**) and Japan (as the **F-104J**), eventually becoming one of the most important fighters of the 1960s and the centrepiece of a bribery scandal which emerged in the 1970s. A two-seat derivative intended for training duties is known as the **TF-104G** (**CF-104D** for Canada), this retaining partial weapons capability. Two other trainer variations, both based essentially on the earlier F-104D, are the F-104DJ for Japan and the **F-104F** for West Germany. The **RF-104G** is the dedicated reconnaissance version of the F-104G.

Specification
Lockheed F-104G Starfighter
Type: single-seat multi-role fighter
Powerplant: one General Electric J79-GE-11A turbojet rated at 4536-kg (10,000-lb) dry thrust and 7167-kg (15,800-lb) afterburning thrust
Performance: maximum speed 2092 km/h (1,300 mph) at 12190 m (40,000 ft); initial climb rate 12495 m (41,000 ft) per minute; service ceiling 16765 m (55,000 ft); tactical radius 1110 km (690 miles); ferry range 3200 km (1,988 miles) with maximum external fuel
Weights: empty 6388 kg (14,082 lb); maximum take-off 13054 kg (28,779 lb)
Dimensions: span 6.68 m (21 ft 11 in); length 16.69 m (54 ft 9 in); height 4.11 m (13 ft 6 in); wing area 18.22 m^2 (196.1 sq ft)
Armament: one 20-mm M61A1 Vulcan rotary-barrel cannon and two tip-mounted AIM-9 Sidewinder infra-red homing air-to-air missiles, plus up to 1814 kg (4,000 lb) of external ordnance



In order to train pilots for this tricky fighter, Lockheed developed a two-seat trainer version, the TF-104G. This retains the NASARR radar and weapon delivery boxes but the internal rotary cannon was deleted.

On patrol over Vietnam: the F-104 served in a minor role in South East Asia on both air-to-air sorties and on low-level, high-speed strikes. It was not too successful at either and was quickly replaced.



Led by the legendary Robin Olds, the 8th Tactical Fighter Wing flying out of Thailand notched up many MiG kills, such as this MiG-17 falling to an F-4D Phantom II. Known as the 'Wolf Pack', the 8th TFW set up some interesting traps for the MiGs, including disguising themselves as bombing F-105s by following the same routes as the daily bomber missions.

Fighters in Vietnam

Nowhere was the 1960s fighter tested out more thoroughly than over the steamy jungles of South East Asia. The USAF flew several types which became legendary into the fiercest concentrations of anti-aircraft fire ever encountered. The attentions of the Vietnamese MiGs made life doubly difficult.

As far as the United States armed forces are concerned, the war in Vietnam provided a splendid opportunity to evaluate a variety of weapons under operational conditions, and the experience gained in battle during the 10 years of war undoubtedly played a significant part in formulating future requirements.

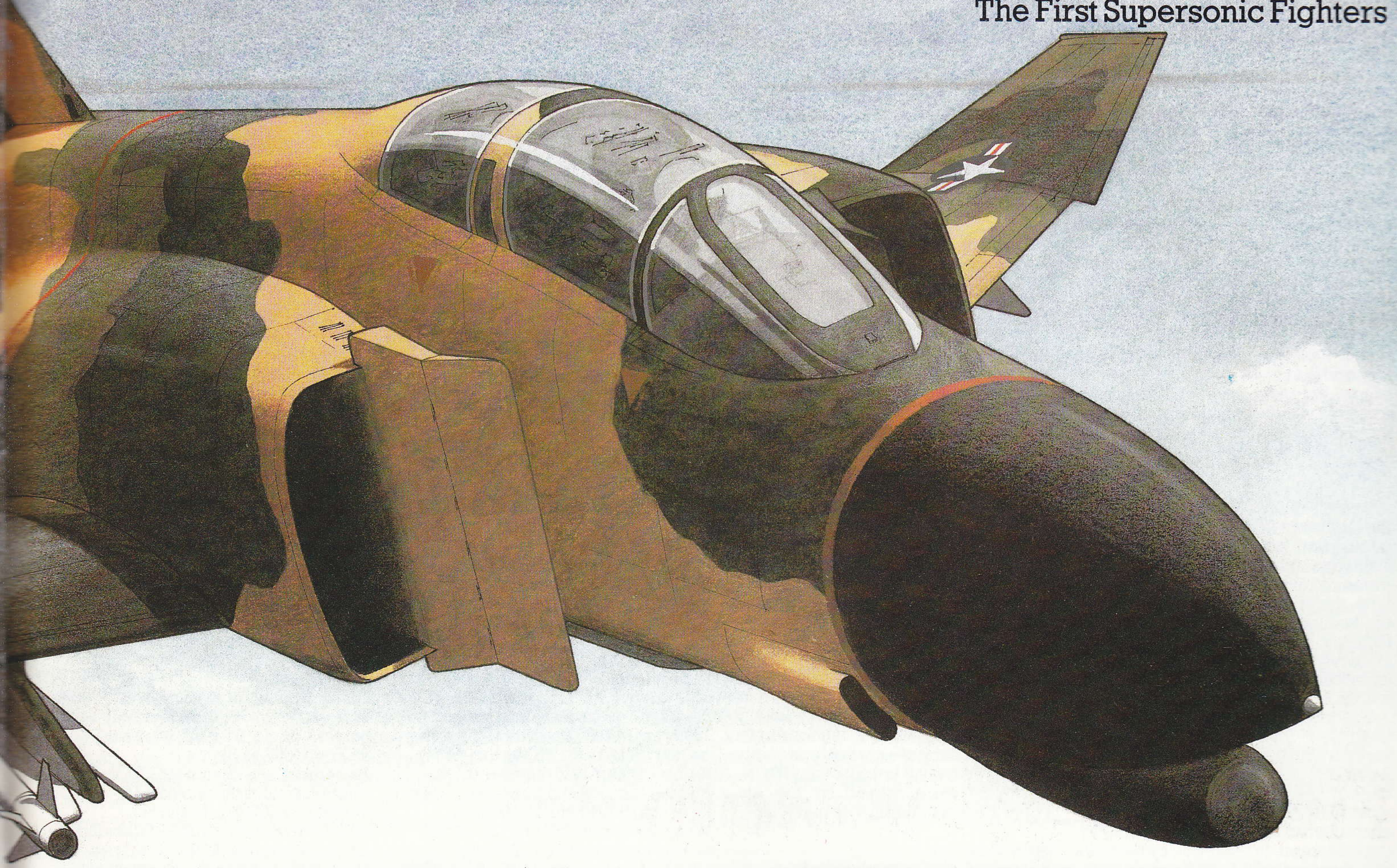
In the case of the US Air Force, and indeed all of the services, such benefits were tempered by the losses in human resources which inevitably occur in any conflict, but there can be no denial of the fact that the current generation of combat jet aircraft capitalizes on the lessons learned at that time.

Although the United States had maintained a small military presence in Vietnam, in the form of advisers, for several years, it was not until the summer of 1964 that the scale of involvement was stepped up. Tactical fighters from the USAF formed part of the initial response to the 'Tonkin Gulf incident', North American F-100 Super Sabres and Republic F-105 Thunderchiefs being committed to action at an early date, but it was not until the start of the 'Rolling Thunder' campaign in March 1965 that heavy and sustained application of air power occurred.

In the event, the 3½-year 'Rolling Thunder' campaign cost the US Air Force dear in terms of both man and machine, the brunt of the losses being borne by the F-105 which was responsible for the lion's share of the 'out-country' war over North Vietnam, operating as a fighter-bomber continuously from 1965 to 1968.

Escort duties were primarily entrusted to the McDonnell Douglas Phantom, initially in its F-4C guise though later, as the war dragged on, the succeeding F-4D and F-4E variants also saw extensive action. Other types which played a significant role in prosecution of the air war included the F-100 Super Sabre, the McDonnell RF-101 Voodoo and the RF-4C Phantom, whilst examples of the Convair F-102A Delta Dagger and the Lockheed F-104C Starfighter were also

Though obsolescent as a first-line USAF interceptor, the F-100 was to play an important part in the war in Vietnam. Operating in both air-to-air and ground attack roles, the aircraft impressed all with its load-carrying ability and sturdiness. Most of its fighting was 'in-country', in the Mekong Delta and around the Central area of Vietnam close to the DMZ (demilitarized zone). The missions were usually against Viet Cong guerrillas rather than the North Vietnamese army. In the course of this counter-insurgency, the Super Sabre racked up over 300,000 missions, more than were flown by the 16,000 P-51 Mustangs of World War II. The amount of armament fired and bombs dropped was colossal and the rewards limited, although the 'Hun' did not suffer inordinate losses.



present for a while although their involvement was of a fairly limited nature.

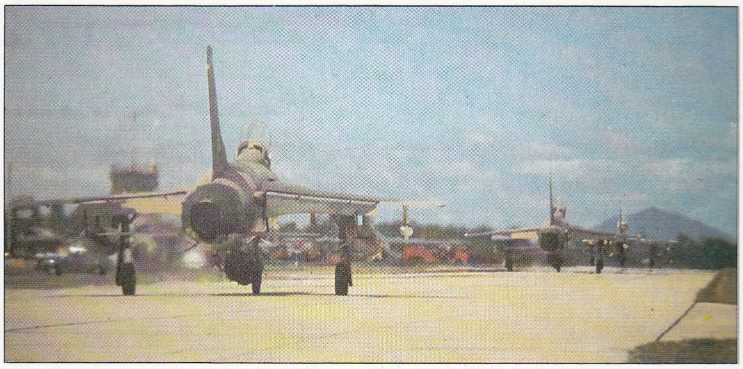
For the most part, the F-100 was confined to operations in the more permissive environment of South Vietnam, single-seat F-100Ds being employed in close-air support tasks and two-seat F-100Fs engaging in the 'Misty' high-speed forward air control role in which they co-ordinated air strikes with forces operating on the ground. With regard to the RF-101 and RF-4C, their work encompassed reconnaissance missions over the entire operating area and, like the F-105, they were particularly hard hit, especially in North Vietnam which, as the war progressed, gained ever more fearsome defences. F-102A Delta Daggers had, by all accounts, a fairly peaceful time, being entrusted with air defence of South Vietnam, hardly an onerous task since North Vietnam never once attempted to raid the numerous bases by air, whilst the F-104C Starfighter's exposure to combat was fairly brief, although the type was used over both North and South Vietnam between 1965 and 1967 and did suffer some losses to enemy fire. Ultimately, in July 1967, the Starfighter gave way to the far more capable F-4D.

One American type which did not fare too well in its initial experience of combat was the General Dynamics F-111A, the 'Combat Lancer' deployment of six aircraft during March 1968 being marred by the loss of three machines in little more than a month of operations from Takhli in Thailand. Although the losses were made good, combat operations ceased and the F-111As saw little more action before they returned to the USA in November 1968. The 'Aardvark' eventually returned to the combat zone in September 1972 when two squadrons were despatched to Takhli, and on this occasion they fared rather better although there were still problems.

In distinct contrast, the 1965-6 'Skoshi Tiger' combat evaluation of the diminutive Northrop F-5A was successful although it did not result in large-scale orders for service with the USAF. Nevertheless, in the course of the evaluation, the F-5 was exposed to combat in both South and North Vietnam as a close support, interdiction, air-to-air and armed reconnaissance tool.

In addition to the USAF, both the US Navy and US Marine Corps each played a major part in the conduct of the air war, using such fighters as the Vought F-8 Crusader and F-4 Phantom for virtually the duration of this conflict. US Navy fighters operating from aircraft-carriers at 'Yankee Station' in the Tonkin Gulf helped carry the war to North Vietnam, whilst their US Marine counterparts for the most part flew from bases in South Vietnam and were concerned principally with their traditional role of supporting US Marine ground forces.

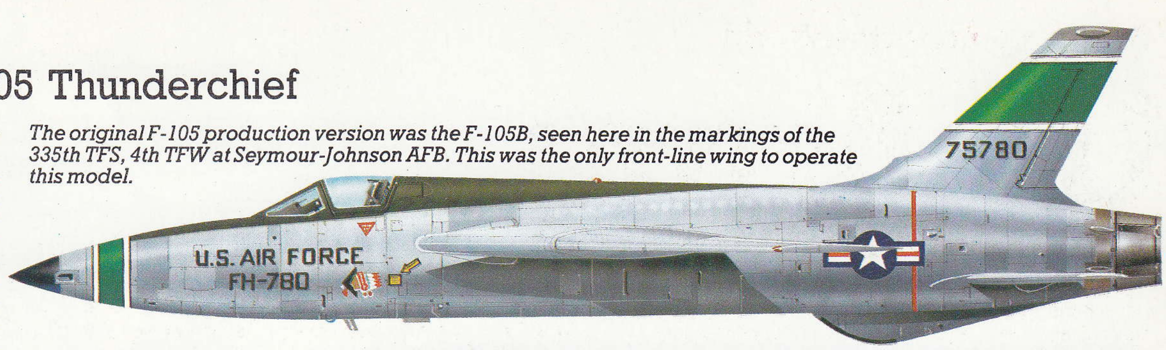
Although the projection of air power in South East Asia was predominantly an American affair, North Vietnam did possess a fairly small air force of its own. Examples of the Mikoyan-Gurevich MiG-17, MiG-19 and MiG-21 formed the combat elements of this air arm, and during the 10 years of war these were responsible for the destruction of a fair number of American fighters in air-to-air combat. Employed essentially in a purely defensive capacity, they operated only over North Vietnam, and on numerous occasions were able significantly to disrupt the US bombing campaign by causing strike aircraft to jettison ordnance well away from the planned target area.



Above and below: The Republic F-105 Thunderchief, in its 'D' version, was the aircraft which took the war to the North Vietnamese in the early days. They suffered heavy losses but their strikes were devastating.

USA

Republic F-105 Thunderchief



The original F-105 production version was the F-105B, seen here in the markings of the 335th TFS, 4th TFW at Seymour-Johnson AFB. This was the only front-line wing to operate this model.

Arguably the greatest of the 'Century series' by virtue of its exploits in combat over South East Asia, the **Republic F-105 Thunderchief** also suffered its fair share of development headaches and teething troubles during its early service career. Like the F-102, it was largely redesigned in detail to take advantage of the benefits bestowed by area rule, and this resulted in performance figures which handsomely exceeded those originally envisaged and which were to prove of inestimable value to the pilots who later flew it in combat.

The F-105 originated as a private-venture successor to the highly successful Republic F-84 Thunderstreak, and was rewarded with a development contract in 1954, the type being intended at that time to fulfil the nuclear strike role. Non-availability of the planned J75 engine meant that the prototype **YF-105A** entered flight test on 22 October 1955 with the J57-P-25 powerplant, and it was not until May 1956 that the definitive engine/airframe pairing took to the air for the first time, this ending in near disaster when the landing gear failed to lower satisfactorily, test pilot Hank Beaird experiencing the ignominy of a wheels-up landing on the dry lake bed at Edwards AFB, California.

Following the completion of flight trials, the **F-105B** variant began to enter service with the 335th Tactical Fighter Squadron in August 1958, but its early career was marred by poor serviceability rates, most of the problems encountered being allied to the highly sophisticated fire-control system. In the event, only 75 F-105Bs were built, production switching to the even more advanced **F-105D** in 1958, and this eventually became the definitive variant, 610 being completed by January 1964, just a few months before the type began to fly combat missions in Vietnam.

Although attempts to produce a two-seat model for training duties had been made in the 1950s it was not until the advent of the **F-105F** that these succeeded, the 143 aircraft of this subtype that were manufactured having been ordered originally as F-105D single-seaters. Retaining full operational capability, the F-105F also saw extensive combat action and provided the basis for the 'Wild Weasel' surface-to-air missile suppression modification, specially configured F-105Fs undertaking this hazardous duty for much of the Vietnam War. At a later date, approximately 60 were fitted out with an internally mounted jamming system and other mission-related equipment, these being known as **F-105G** aircraft.

After a service career spanning some 25 years, the last airworthy Thunderchiefs were retired by the Air Force Reserve during February 1984.

Bombed-up and headed for Vietnam, this F-105D carries conventional bombs, some fitted with fuse extenders which ensured the bomb exploded before it buried itself in the mud. These were commonly referred to as 'daisy-cutters'.

Specification

Republic F-105D Thunderchief

Type: single-seat strike fighter

Powerplant: one Pratt & Whitney J75-P-19W turbojet rated at 7802-kg (17,200-lb) dry thrust and 11113-kg (24,500-lb) afterburning thrust; thrust could be increased to 12020 kg (26,500 lb) for 60 seconds by the use of water injection

Performance: maximum speed 2237 km/h (1,390 mph) at 10970 m (36,000 ft); initial climb rate (clean) 10485 m (34,400 ft) per minute; service ceiling 15850 m (52,000 ft); tactical radius 1480 km (920 miles) with two Bullpup missiles and three drop tanks; ferry range 3845 km (2,390 miles)

Weights: empty 12701 kg (28,000 lb); normal loaded (clean) 17252 kg (38,034 lb); maximum take-off 23835 kg (52,546 lb)

Dimensions: span 10.65 m (34 ft 11¼ in); length 19.51 m (64 ft 0 in); height 5.99 m (19 ft 8 in); wing area 35.77 m^2 (385 sq ft)

Armament: one 20-mm M61A1 Vulcan rotary-barrel cannon, plus up to 5443 kg (12,000 lb) of external ordnance including AIM-9 Sidewinder air-to-air missiles, AGM-12 Bullpup air-to-surface missiles, conventional bombs, napalm and rockets

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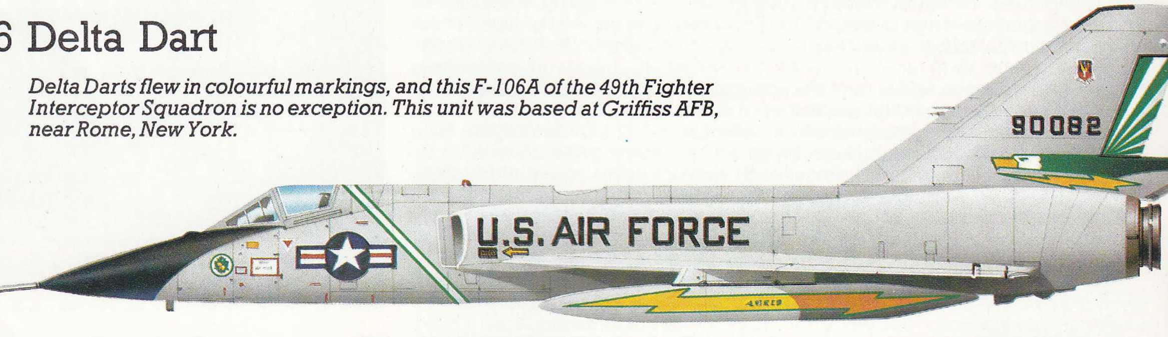
USA

Convair F-106 Delta Dart



Delta Darts flew in colourful markings, and this F-106A of the 49th Fighter Interceptor Squadron is no exception. This unit was based at Griffiss AFB, near Rome, New York.

A substantially improved development of the F-102A Delta Dagger, the **Convair F-106 Delta Dart** began life as the **F-102B** and was intended to fulfil the 1954 'Ultimate Interceptor' requirement. Work on the F-102B got under way during the early 1950s, the first formal contract being awarded in November 1955 and calling for an initial batch of 17 aircraft. But by June 1956 it was fast becoming apparent that the proposed F-102B would differ significantly from its predecessor and it was therefore decided to redesignate it F-106.

Flight testing of the new interceptor began on 26 December 1956, and while early USAF trials revealed great promise subsequent evaluation revealed deficiencies in the areas of acceleration and maximum speed; Convair therefore incorporated a few modifications to achieve the desired objectives. Inevitably this resulted in delay which, coupled with the USAF decision also to purchase the McDonnell F-101B, almost brought about cancellation in 1957. Finally, it was decided to continue with both types but this in turn greatly reduced planned acquisition, total production of the Delta Dart being just 340 instead of the 1,000 originally envisaged.

Of this figure, 277 emerged as single-seat **F-106A** interceptors, this variant entering service with the 498th Fighter Interceptor Squadron at Geiger AFB, Washington, in 1959, whilst the remaining 63 were tandem two-seat **F-106B** aircraft for training tasks with effect from July 1960.

Despite the numerous problems encountered in development and early service, the Delta Dart proved to be a fine interceptor and progressive modification enabled it to keep pace with improvements being made in the field of air defence. Today, it still equips three front-line units as well as four Air National Guard squadrons, but the phase-out process has begun and it now seems likely that the Delta Dart will disappear from the active inventory in about 1987-8.

The Delta Dart soldiered on in the defence of the United States, slowly being replaced by the F-15 Eagle. Several others serve on test units, such as this Weapons Development F-106A.

0-90082
U.S. AIR FORCE

Specification

Convair F-106A Delta Dart

Type: single-seat all-weather interceptor

Powerplant: one Pratt & Whitney J75-P-17 turbojet rated at 7802-kg (17,200-lb) dry thrust and 11113-kg (24,500-lb) afterburning thrust

Performance: maximum speed 2454 km/h (1,525 mph) at 12190 m (40,000 ft); initial climb rate 12130 m (39,800 ft) per minute; service ceiling 17375 m (57,000 ft); combat radius 925 km (575 miles) on internal fuel

Weights: empty 10726 kg (23,646 lb); maximum take-off 17554 kg (38,700 lb)

Dimensions: span 11.67 m (38 ft 1½ in); length 21.56 m (70 ft 8¾ in); height 6.18 m (20 ft 3¼ in); wing area 58.65 m^2 (631.3 sq ft)

Armament: various combinations of AIR-2A Genie, AIR-2B Super Genie, AIM-4F Falcon and AIM-4G Falcon air-to-air weapons carried internally; aircraft with the 'Sixshooter' modification can carry one 20-mm M61A1 Vulcan rotary-barrel cannon

US Army

Part 1

From its home base in the continental USA, this army garrisons large forces in West Germany, South Korea, Italy, Japan and the Panama Canal Zone. It stands behind seven major defence treaties, the most crucial being the North Atlantic Treaty Organization (NATO) and the US-Republic of Korea Mutual Defense Treaty. Additionally, the US Army operates Foreign Military Sales (FMS), International Military Education and Training (IMET) and Military Assistance Groups (MAG) in 53 nations. Army attaches, who are on detail to the Defense Intelligence Agency for their diplomatic postings abroad, serve at embassies in 76 capitals.

The US Army has 781,648 soldiers on active duty, of whom 74,360 are women. A further 901,153 soldiers can be called to active duty from the ranks of the Army Reserve and the Army National Guard.

This vast force naturally influences many areas of American society (veteran Dwight D. Eisenhower warned Americans of the impact of a 'military-industrial complex'), but throughout its history the US Army has remained faithful to the civilian leadership it serves. A military coup would be unimaginable. The US constitution and American tradition place command of the military in the hands of elected civilians or their civilian appointees. In wartime, the National Command Authority passes from President to Vice President to Secretary of Defense.

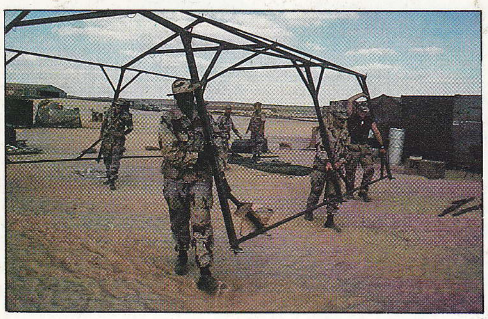
Pre-dating the formation of the United States itself, the US Army had its nucleus in the rebel force which ousted the British in the Revolutionary War (1776-1783). The US Army was formally established in 1783 and defeated British forces again in the War of 1812. Thereafter, at times neglected and down to a few companies while state militias predominated, the US Army throughout the 1800s fought its series of Indian wars far from the centres of population and power. Torn asunder by the Civil War (1861-5), where West Point officers commanded on opposing sides and casualties were staggering, the US Army then became an insular body, separate from the rest of the nation: a professional fighting force which took men, trained them, and sent them off to war on the western plains, in the Caribbean and as far as the Philippines. With the entry of the United States into World War I, a newly-expanded US Army backed by the nation's industrial might helped determine the outcome. Then the US Army settled down to garrison duties until 1941, when it again went to war and helped assure Allied victory over Germany and Japan.

The years since VJ-Day have seen the conflict in Korea (1950-3), and the longest war ever fought by Americans, in Vietnam. The built-up US Army in Vietnam suffered from eroded discipline, drug abuse and racial strife, but on the battlefield the American soldier acquitted himself well. Low morale resulting from failure in Vietnam followed by lean budgets during the Carter years is now beginning to pick up. Under a conservative administration generous in seeking funds from the Congress, the US Army has managed to bring itself back to its traditional sense of purpose.

Failure, of course, must be blamed on the decision-maker and the diplomat while success, all too often, must be wrought by brave young men in battle. The American soldier is, in the end, no more than the final resort on the cutting edge of American policy. Whether a private or a general, his equipment, training, doctrine and valour must come from what he is given and what he is told to do. In Fiscal Year 1984, he will be given an unprecedented $274.1 billion in the US defence budget. He will be given AH-64 helicopters, M1 tanks, and an unpopular new-style helmet. And he will be told to take on challenges equally without precedent in a nuclear world which is a nightmare for the Pentagon's planners.

Policy and pragmatism in the 1980s require a rapid deployment force able to fight and win in the heat and sands of Middle East oilfield country, in the raging cold of the Arctic, or wherever Washington

The 82nd Airborne Division is the prime US Army component of America's Rapid Deployment Joint Task Force. Celebrating after the brief Grenadan operation, the 82nd demonstrate a new-found willingness in the US government to intervene militarily overseas.



American troops start erecting a tent in Egypt during Exercise 'Bright Star', held in 1982. As there were no pre-positioned stockpiles of weapons and other essential equipment, the Americans had to bring everything they required by air or sea, which is time-consuming and expensive.

Troopers of the 1st Cavalry take a well-earned break during the 1983 'Reforger' exercises, which are designed to test the rapid reinforcement of Europe by air and sea. Some units come complete with their equipment, while others use weapons and stores stockpiled in Europe.

decides. Some of the troopers who saw their equipment snarled by sand on manoeuvres in Egypt, and who lost mates in the daring but fruitless April 1980 rescue raid in Iran, found themselves under fire recently on the little-known Caribbean island of Grenada.

Current manpower of the US Army is 781,648 of whom 218,913 serve in Europe, 31,000 in the Far East (mostly in Korea) and 7,900 in the Canal Zone.

The US Army's enlisted men and women volunteer from all walks of life for an initial three-year tour of duty. The draft was eliminated with the creation of the 'all-volunteer Army' in 1974 (although registration for the draft for 18-year-olds was reinstated in 1981) and a return to general conscription is probably a political impossibility today. Critics charge that this means that the USA no longer has a 'citizen army', and for the first time since 1940 a generation of young Americans includes many who have never donned a uniform. For a time, the 'all-volunteer' concept attracted disproportionate numbers of racial minorities and new immigrants, creating a low educational level and a mentality where 'comic books' were needed to teach a man how to drive an armoured personnel carrier. It remains true that blacks, 13 per cent of the US population, make up 29.3 per cent of the US Army. But the economic recession and better pay benefits have recently attracted better-qualified recruits of all backgrounds. A private can reach non-commissioned officer (NCO) status in three years and retire with a pension after 20 years, a strong inducement for men and women who can receive a pension beginning as early as age 37. Retention of skilled NCOs, especially those with technical credentials needed by industry, remains the US Army's critical personnel problem.

The US Army long ago eliminated its segregated Women's Army Corps (WAC) and opened up most career ladders to the fair sex, with encouraging results. Since 1978 the number of women in the US Army has rocketed from about 12,000 to the current 74,360. Although women are precluded by law from assuming combat duties, nearly all military occupation specialities (MOS) are open to them, and the US Army recently re-opened 13 out of 26 specialities which had earlier been defined as 'combat' duties.

The bulk of the officer corps now comes to the US Army from the 303 colleges and universities which offer Reserve Officer Training Corps (ROTC) programmes. ROTC training is only incidental to a four-year university education, and is voluntary. It leads to a reserve commission as a second lieutenant who then, on entering active duty, proceeds to his branch Service school. A few US Army officers in the Medical Corps, the Army Nurse Corps, and the Chaplains' ranks come directly from civilian life, and recruiting of these highly-qualified people, especially doctors, remains difficult.

The elite US Army officer comes from the 'long gray line' (for the uniform colour) of the United States Military Academy at West Point, the ivy-covered institute in upstate New York which has bred the nation's lieutenants, generals and heroes since the 1800s. Competition to enter West Point is fierce, and its four-year mix of military and university education is gruelling. Cadets may take Airborne and Ranger training during their course and, on graduation, must serve five years. Entering cadets are college students; upon entering, they become members of the armed forces in the special category of cadet, not fully 'officer' or 'enlisted'. During their senior year, each selects the branch of service (Infantry, Artillery, Corps of Engineers, etc.) in which he or she will receive a regular commission as a second lieutenant. The sense of tradition in the halls and on the parade grounds at West Point is chilling: West Pointers have fought in all the nation's wars except the first, and 21 per cent of the Class of 1964 died in Vietnam. In his final public appearance in 1962, an ageing General of the Army Douglas MacArthur (Class of 1904) talked to the Point's cadets about his own days there and concluded with an impromptu speech which has become one of the most famous in American history, centring on the three words essential to a West Point officer's life: duty, honour and country.

Once accepted for active duty, whether recruited as a private or commissioned at the Point, the US Army soldier is trained in one of over 400 military occupation specialities at one of several dozen training establishments. Enlisted recruits begin with an eight-week 'boot camp' indoctrination at one of three locations and then proceed, as do new officers, to their Army Service Schools. Some of the most important of these are listed on the accompanying chart.

For officers, further leadership and military technical training comes at each stage in a career. For those at field grade (major or above), the most important is the Command and General Staff College at Fort Leavenworth, Kansas. The course at this institute runs for one year, and without it no officer is likely to ever wear a general's star on his shoulder. Other key institutes are the Armed Forces Staff College, an inter-service establishment at Norfolk, Virginia; the Industrial College of the Armed Forces (ICAF) and the National War College, both located at Fort McNair, Washington, DC. Army officers are also eligible for courses given for senior managers by other branches of the government, such as the Department of State and the Central Intelligence Agency. A successful course, like a combat decoration, is seen as a 'ticket' to promotion and to an important command slot.

7th Cavalry troopers board an Air National Guard Lockheed C-130 of the 179th TAG at Düsseldorf. Flown from the USA, they are about to pick up their heavy equipment which has been pre-positioned on the NATO Central Front.

AIR-FREIGHT DÜSSELDORF